Member of Associated Business Papers, Inc.

Member of Society for Electrical Development, Inc. *Member of Audit Bureau of Circulations*

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. 70—No. 17. CHICAGO, SATURDAY, APRIL 28, 1917. PAGE 689

Generation Leaks Should Be Stopped

AT a recent convention of New England central-station men, the issue was raised whether it is worth while to work out generating costs in detail from month to month, itemizing each of the factors that enter into production. A consulting engineer of Boston believed that totals, showing a decrease of an increase in the whole cost, were more significant and valuable. To this suggestion the auditor of a large company, who has made a thorough study of all the details of operation, replied that slight variations in the itemized expenses per kilowatt-hour are of significance and importance as showing something that should be looked into and remedied.

We believe that the latter practice is the better of the two. Electrical energy is a product made from several ingredients, if one may so term the factors that enter into production. In effect it is exactly as if a certain per cent of the whole output were made from coal, another part from water, another from oil, waste, etc., and yet another the creation of the hands and brains of the men in the power station and the men in the general office. Looking at central-station product in this light, it is seen to be a complex product and not a staple.

It is both the proper aim and also the bounden duty of the central-station management, especially in these days of imperative efficiency, to produce all the energy possible from a given amount of "raw material." If there is a waste or deficiency somewhere in the process, let it be ferreted out and a remedy applied as soon as possible.

An Energetic Commercial Policy

THERE lie before us some 1916 operating figures of two central stations in the same state which illustrate in a striking degree the difference between an energetic commercial policy and one in which the value of power business seems less appreciated. Let us see which company is serving its community to better advantage.

Both companies serve cities of the industrial type, with well over 100,000 inhabitants each. Company "A" has a connected motor load of 3,203 kilowatts; company "B" has a load of 6,980 kilowatts. Here is more than a two to one development, and yet the cities are not far from the same size.

Company "A" has a connected lighting load of 5,348 kilowatts. Its neighbor has a connected load of 7,685 kilowatts in this class of service. Before we go any farther, let us state that the less progressive company is an old-line combination gas and electric system, while its contrasted system is a "straight" electric company.

Look at the station costs. Company "A" generated only 7,900,776 kilowatt-hours last year against 22,385,480 kilowatt-hours on the part of its neighbor. The net production cost was 1.05 cents per kilowatt-hour for "A," and 7.9 mills for "B." Coal cost "A" $5.175 per ton and at "B's" plant it was $4.40. Here is quite an apparent difference in favor of "B," and yet nearly 90 per cent of "A's" output came from water-power installations owned by the property, so it ought to have done well on production. Had all the energy been derived from coal, there would, we think, have been a much higher manufacturing cost on the part of the "A" company.

At the power plants, company "A" expended $25,436 in wages to produce less than 8,000,000 kilowatt-hours. This other system, spending $30,976 on station wages, and operating modern steam turbines on a high-class day load which even at Christmas time ran along at 5,500 kilowatts in the face of a peak of but 1,600 kilowatts more, turned out more than two and one-half times as much energy. The peak day load curve of the less efficient system resembles a cross-section of the Matterhorn, with a base extending from 8 a. m. to 8 p. m. and no "table land" of profitable heavy power output sustained hour after hour by a dominating or at least a most influential motor service.

One or two more points and our analogy is completed. Company "A" sold 1,910,325 kilowatt-hours to motor users last year, compared with 9,934,326 kilowatt-hours in "B's" case. The revenue from street lighting in the former case slightly exceeded that from power service! The less progressive company took in but $78,812 from power sales, while its more energetic neighbor sold power to the tune of $208,791. Where the public scored was in the respective average power rates. The "B" public received its power at an average rate of about 2.1 cents per kilowatt-hour, compared with about 4.1 cents at "A."

There is little to be said in the face of figures like these, when one seeks to determine which company is

rendering the more useful service to its community. Doing a far greater volume of business at lower unit rates, can there be any question that the "B" company's standing in the community as an economically useful concern far exceeds that of company "A"? We happen to know that the "A" company is somewhat handicapped by the fact that some of the large industrial concerns of its territory are owners and operators of large power plants and local distribution systems within their premises, both steam and water; but it is only fair to point to the fact that still a third company in the same state, serving again a city of about the size of the foregoing, and with less diversity in manufacturing (according to our recollection) than company "B," is forging ahead at a rapid pace and developing a most enviable power service. Certainly maximum usefulness in a central station today must be equated with the vigorous effort to render as nearly a universal service within a stated territory as economic supply will permit.

Capitalizing Construction Expenditures

THE question of capitalization is of more than academic interest in the administration of public utilities. It is of significance to other departments than the accounting branch of an organization, although of necessity its technique specially concerns the man behind the ledger. As regulation progresses, cases arise again and again in which the question as to the capitalization of specific items receives earnest consideration. It is wholesome for every public utility official of executive rank to devote some thought to those problems of deciding where to charge particular expenditures, many of which are still open to settlement.

Take, for instance, the items associated with cable construction which have come to the front lately—tagging and testing. Should these be included in capital charges, and thus established in the investment upon which a reasonable return is to be attempted through adequate earnings? If tagging is done when the cables are originally laid by the manufacturer, contractor or public utility company, there would seem to be no question as to the propriety of including its cost in the investment. But if the tagging is performed later, when operation discloses the necessity of identification by positive means in manholes for the protection and convenience of employees, it may be argued that since the tagging does not increase the earning power of the property in any direct way, it should be made an operating charge. As a matter of fact, tagging is actually a measure in the direction of increasing the efficiency of company labor; it is a time-saving piece of work, and tends therefore to increase net earnings by enabling the maintenance staff and the construction force as well to accomplish more in a day. Gross earnings may not increase a dollar as a result of tagging cables, but surely this is not the only test. If net earnings increase, or tend to, the economic status of the property is heightened and a permanent benefit accrues. Therefore it would seem that the initial tagging, whether performed at the time of cable installation or at a later period, may very properly be charged to capital in computing the investment in distribution plant on which the return is to be made. It is a minor construction expenditure, to be sure, but it is a permanent addition to the property.

Testing newly installed cables to make sure that they will carry their rated load and voltage before putting them into regular service is likewise a charge associated with original construction. Routine testing after the operating regimen has been attained, would seem to be unjustified as anything but an operating charge. An interesting case arises where a company puts down an installation, let us say, of 13,800-volt cables, but operates the system for a number of years at 6,900 volts. The increasing loads ultimately necessitate going to the higher voltage. Now presumably a regular test was made of the insulation and carrying capacity of these cables for 6,900-volt service, but when the demand for higher-voltage operation becomes pressing, a test must be made to determine whether the cables are fit (and after years of service, too, it may be) for their new work. Shall the charge for the second test be capitalized, in determining the rate-carrying investment?

The answer in a practical case of this character was "Yes," because through the testing program followed (we do not mean routine service tests) the capacity of the distribution plant was increased permanently. Associated with the tests came considerable new construction based upon the results of these determinations. It so happened that in one case over $232,000 had been expended in distribution equipment. To fit this equipment with its auxiliary switching and other apparatus, including insulators, crossarms and pole fittings, for duty at double the former voltage, an outlay of about $12,700 was required. Without this expenditure it would have been necessary to increase the investment by a far greater amount; with it, the system section concerned was put upon a new plane of usefulness, and the consumer was relieved of very substantially increased fixed charges. The $12,700 would not have paid for two miles of additional 13,800-volt cable installed, but applied as it was, it increased the capacity of the system in a permanent way, and in the judgment of the company's engineering and accounting staff, was a properly capitalizable item.

Questions of this kind are not as a rule susceptible to a 2 times 2 equals 4 solution, but they bear directly upon the net earning power of an operating company and indeed upon the basis of rate-making. The fact that so many of them lie in the twilight zone between operating costs and capitalizable outlays but makes them the more interesting to utility men with analytical types of mind. Although they are in a sense by-products in many regulation proceedings, they embody principles of enduring value.

HAPPENINGS IN THE INDUSTRY

Reasons Why N. E. L. A. Convention Was Postponed---Important Electric-Vehicle Meeting in New York City---Pacific Coast Section Meeting---Ohio Transmission Meeting---Activities of Manufacturers

REASONS WHY N. E. L. A. CONVENTION WAS GIVEN UP.

President Wagner Issues Statement Calling for Mobilization of the Industry.

All arrangements for holding the fortieth convention of the National Electric Light Association at Atlantic City, N. J., beginning May 28 have been perfected in detail, including the complete program for some 25 sessions, also for an unusually large manufacturers' exhibit to be chiefly educational in character. For Wednesday evening, Decoration Day, a patriotic meeting with addresses by prominent men was scheduled. Recent developments, however, in connection with the mobilization of industries for the most efficient preparations for war led to material changes in plans. Up until the last moment it had been hoped and believed that the annual convention of the Association could be held as usual, but in these days of national crisis events march swiftly, and decisions with reference to the aspect of affairs, changing from day to day with equal promptitude have to be made. The opinion now prevails that the date for holding the convention should be advanced and that the meeting itself should be materially changed in character.

Perhaps never before have we been confronted with conditions affecting our members which make it more desirable and necessary to get together and discuss ways and means for the conduct of our affairs within the next year.

We are compelled by every dictate of citizenship and patriotism to do all in our power to uphold and assist the Government in the prodigious task before it and to lead in encouraging patriotic service and sacrifice, while at the same time we must continue to serve the community in which we operate and to furnish power to industries upon which the Government will be dependent for supplies and lighting for the protection of property and citizens. We must assist the Government particularly in the organization, on the most efficient basis, of the industries of the country, that they may not be seriously interfered with by the draft of men for strictly military service. It is necessary to find means through organization and government co-operation to use our highly trained men for the most useful service, which will in many cases be in continuing work which they have at present in hand. We need to consult with each other and to consider these matters and the convention called for this May should present an early and unequaled opportunity for this.

In order that these most important matters should have first and full consideration, it is now deemed advisable to curtail as far as possible our proposed program, leaving this to be presented merely in the formal way of receiving printed reports and papers with discussions to be presented in writing at a later date. This radical change in the program will probably result in the natural limitation of attendance largely to the direct representatives of member companies.

Therefore, with the highest welfare and interests of the Association at heart and in view of the power invested in me, as president, by the Executive Committee to decide the time and place of the annual meeting, and after receiving the benefit of a full discussion of the matter by the Public Policy Committee, I have issued instructions to the Association staff and its committees to cease all preparations for Atlantic City and to abandon all work in connection therewith.

The regular continuance of Association functions, under the Constitution, requires an annual meeting in May or June. In the confidence that the Executive Committee at its meeting on April 27th will ratify my action, I now give notice, therefore, that I call an annual convention to be held at the United Engineering Society Building, being the headquarters of the Association, 29 West 39th Street, New York, on Wednesday and Thursday, May 9 and 10, of Class A and D member companies and such of their member officers and member employees as may be delegated to attend, for the discharge of regular business and the consideration of such other matters as may be deemed necessary to dispose of at that time. Admission to meetings will be limited to those presenting credentials from Class A and D members. Executive sections will be limited as usual to Class A delegates.

It is realized that this is very short notice, but we must yield to the necessities of the situation and shape our affairs with the aim of ensuring the welfare of our country and the highest efficiency of the industry. To these ends, I invite and request the fullest co-operation of all member companies.

MAINE LEGISLATURE DISCUSSES IMPORTANT HYDROELECTRIC MATTERS.

Question of Permitting Sale of Energy Outside the State Receives Greatest Consideration.

The Legislature of Maine has defeated a measure which aimed to socialize the water powers of the state by creating a board on the lines of the Province of Ontario Hydro-electric Commission which should have plenary powers over the water of the state. The Judiciary Committee, which heard the bill, reported adversely.

The right of electric companies to transmit energy beyond the limits of the state was hotly debated at a session of the House of Representatives April 3, when the proposed extension of the charter of the Western Maine Power Company was being considered. The House had previously passed an amendment forbidding this company exporting power. In the Senate this was stricken out.

Representative Baxter, the originator of the amendment, insisted on this provision. He claimed the inclusion of the right to send current outside the state would result in the large companies of Portland and Augusta uniting with the Western Maine to transmit energy to New Hampshire.

Representative Barnes, of Houlton, opposed the Baxter amendment on the score of a fair deal to the electric companies. The amendment was sustained, however, 43 to 36, this provision being a component part of acts relating to the Clark Power Company, an act authorizing the development of dams and storage basins on Bog Brook; an act relating to the Central Maine Power Company; an act to authorize the Oxford Electric Company to extend its lines into the town of Hebron and an act to incorporate the Casco Water Electric Light & Power Company.

Governor Milliken has taken the ground that export of power is contrary to the public interest. He advocates a thorough study by the state of its waters and the possibilities for their development.

ELECTRIC-VEHICLE ADVERTISING AND DISTRIBUTION PROBLEMS.

Section Meeting Considers Steps to Gain Greater Recognition for the Electric.

Advertising and merchandising of electric vehicles were the principal topics discussed at an enthusiastic meeting of the Electric Vehicle Section of the National Electric Light Association, at New York, N. Y., on April 19. Chairman E. S. Mansfield presided and addresses were delivered by P. D. Wagoner, president of the General Vehicle Company; C. D. Fairgrieve, of the Anderson Electric Car Company; C. A. Street of the Walker Vehicle Company, and E. P. Chalfant of the Anderson Electric Car Company.

In his address on distribution problems, Mr. Wagoner said that merchandising of commercial vehicles is naturally divided into two classes: (a) Sales direct to the user by branch offices; (b) wholesaling through dealers.

A casual observer might conclude that the policy of vending passenger cars is a settled and uniform one; this is not so, for even in the gasoline passenger-car industry this does not hold true. For example, during the past year one of the most prominent gasoline passenger car manufacturers has largely switched from dealers to direct branch sales with sub-dealers.

There are other passenger car companies that market through branches and sub-dealers, although frequently the branches may be separate companies with distinctive names, and therefore on the surface it is not apparent that in reality they are branches. Broadly speaking, it might be correct to state that the policy of merchandising in the automobile industry in a great many instances is through branches or their equivalent in the larger centers in order to concentrate distribution, and through dealers or sub-dealers at other points, although there are automobile companies that apparently distribute their product through dealers exclusively.

The electric truck manufacturer was one of the first in the automobile field to more or less universally adopt the branch-office method of selling. Experience has demonstrated, however, that the electric truck cannot be marketed through branch offices as successfully as is a typewriter, a dictaphone, or a burglar-proof safe, except at prohibitive selling cost in all but a few cities. So a transition from highly specialized selling to a broader, and, Mr. Wagoner believes, in view of changed conditions, a more general use of wholesale distribution is a natural and logical one.

Electric and gasoline commercial vehicle manufacturers have in the past approached the proposition from different angles:

(a) Electric in general through direct retail salesmen.

(b) Gasoline in general through dealers.

A reason for this was that the electric is limited in its successful application and requires more expert salesmanship. Gasoline trucks were and are still sold, generally speaking, wherever an order can be secured. This adds to the natural handicap of the electric, which finds its field invaded from all sides. This condition has probably influenced the continuation of retail selling.

"The electric vehicle has been greatly influenced by its intimate association with the electrical industry as a whole," Mr. Wagoner stated. Whether its relatively small production and slow distribution has been due to this fact—whether it would benefit by being largely divorced from the electrical industry, I am not quite sure, but I am convinced that the trend is all toward adopting methods of distribution which at least parallel those of the automobile industry in general."

Distribution Through Dealers.

During the past three years the General Vehicle Company, Inc., has gradually opened up a wide field of distribution through dealers, with the result that it now has the foundation for a comprehensive dealer organization throughout this country and abroad.

The original dealer plans were to exploit the product through central stations, acting as selling agents. It was found, however, that (a) barring two or three exceptions they were not interested; (b) their organizations were so large as to be unwieldy and unproductive on such a highly specialized proposition; (c) their operating departments were not inclined to co-operate with their commercial department by using electric trucks; and (d) their commercial department was not as active as competing gasoline truck salesmen.

Experience indicates that, except in individual cases, manufacturers cannot depend upon the central station for such co-operation as its real interest in the situation warrants from the standpoint of its being a permanent beneficiary of every vehicle sold. It would seem to be to the best interests of all manufacturers to secure active independent dealers, and then for both the manufacturer and the dealer to secure such co-operation from the central station as may be obtainable.

Mr. Wagoner stated that real co-operation to be of value should include the following: (a) purchase and use of electric vehicles wherever they can be efficiently applied; (b) purchase of such vehicles through the local agent as a stimulation to him—a stimulation both financial and psychological: (c) have power solicitors actively canvass for prospective business and turn it over to the dealer to follow up; (d) co-operate in a financial way, as to terms of payment, etc., in equipping dealer's garage with suitable apparatus; and (e) make effective and attractive vehicle charging rate; wherever possible, not over four cents.

The present policy of the General Vehicle Company is to secure dealers in every city over 25,000 population, and, other things being equal, preference is given in the following order: (a) organization with garage facilities; (b) central stations; and (c) individuals without previous electric vehicle experience whom we can train to sell.

Local Dealers Can Develop Prospects.

It is better business to have a good dealer in the city of Birmingham, Ala., for instance, than to try to cover that city from an office in Atlanta. The dealer knows most of the business men around him and can cash in on the disposition to patronize a brother townsman. He is familiar with local conditions. He can afford to patiently develop prospects, for a fair nucleus of vehicles in his garage will carry the overhead of his business, leaving him his agency discount practically clear profit.

Even at the cost of a substantial discount, it is generally to the manufacturer's advantage to sell through a dealer. In the long run it is cheaper, except in large centers, and where he can sign up a dealer for a definite number of trucks per year it steadies his production, distributes the burden of introductory selling, and, altogether, is a safer and wiser method of securing distribution.

For several years to come, however, it probably will be difficult to secure in the quantity desired good electric truck dealers. We must concede that it is easier to sell gas trucks than it is to sell electrics, particularly low-priced gas trucks. It is hard to get the prospective dealer to see that while it takes a little longer to break the ice with the electric, once the ice is broken in a locality, care being used to properly adapt each truck to its work, the re-order business on the electric will be greater and more sure than on the gas truck. There is less free service in the case of the electric since there are fewer breakdowns. Each electric sold aids in the sale of another, and combining such sales with the income from the garage, the electric truck dealer can be sure of a constantly growing income.

E. P. Chalfant, in his address on "Co-operation," said: "The manufacture and sale of electric vehicles represents 100

per cent of our business, and the sale of electricity for charging these vehicles represents probably less than 5 per cent of the business of the central station. Nevertheless, a partnership arrangement for educating the public to the potentiality of electric vehicles, and making it as easy to own and operate that vehicle as the Standard Oil Company has made it easy to own and operate a gasoline car, will develop the industry to a volume of business that will return handsome profits to both partners. Vice-President Fairgrieve, of the Anderson Electric Car Company, presents the most logical plan, namely, that a fund provided by central-station interests, and made available through N. E. L. A. headquarters, be added pro rata to the annual appropriations of the manufacturers, to increase the volume of advertising, conditional upon two-thirds of the space being devoted to electric vehicle educational matter, and the remaining third to the exploitation of the particular vehicle being advertised. This plan presents undoubted merit."

Mr. Chalfant also suggested that the central stations and the electric vehicle dealers co-operate with the proprietors of suitably located gas-car garages and arrange for the installation of charging apparatus, suggesting that the central station loan an outfit for a period of six months to demonstrate its practicability. He advised, however, that it was of "paramount importance" that the proprietor and employes of the garage be thoroughly instructed in the use of the apparatus and the proper care and testing of batteries.

Mr. Chalfant's conclusion is as follows:

"But first and foremost comes the need of educating the central-station officials themselves, and their commercial department managers, to the utility and practicability of electric vehicles, and in the majority of cases this must be done, and done thoroughly, before the recommendations contained in this paper will be accepted and put into practice.

"This means that the story of the electric vehicle must be carried direct to each central station in turn; carried by a big brainy man, absolutely neutral in his sentiments, employed for the purpose and directed in his work by the N. E. L. A. headquarters, the cost of the undertaking to be shared in just proportion between the N. E. L. A. itself and its Electric Vehicle Section members.

"This emissary must be big enough to inspire the confidence of the central-station interests in his plans of co-operation, must then assist in organizing the work where this is necessary, must bring the local dealers into the friendly contact with the proper business heads at the power station offices, and in many cases must stay on the ground until the scheme is successfully put into practice.

"When this educational plan becomes operative, all of the ideas proposed herein will follow in natural order."

Advertising and Publicity.

G. D. Fairgrieve, in his address, stated that the one greatest obstacle that to date has prevented the electric automobile manufacturers from doubling and trebling their output from year to year is the existing ignorance on the part of the masses of automobile purchasers as regards the real utility, economy and convenience of the electric car. Records prove that once a man becomes the user of a modern electric, he repeats with the purchase of his second, third, fourth and fifth cars. The electric automobile manufacturers not only need, but must have, both financial and moral assistance in good, liberal quantities, and at an early date, or they may have to give up this one-sided struggle.

In concluding Mr. Fairgrieve made the following recommendations: First, that central stations run, at their expense, a series of advertisements in their local newspaper, copy to be educational, of the merits of the electric car—to be impartial as to any particular make of car, and to have such copy state that the use of the electric car has the unqualified indorsement of the advertiser.

That the first campaign consist of a series of 50 advertisements of approximately 500 lines each, to be run twice a week, commencing on or about August 15, 1917.

That copy for such advertisements be prepared by the Electric Vehicle Section of the National Electric Light Association, or by a committee of electric-vehicle manufacturers, who would be appointed by the Electric Vehicle Section.

That this copy be sent to all central stations who would engage in the campaign, prepared in the form of mats ready for the newspapers.

Second, that the central stations inclose with their monthly statements to clients, or where it seems advisable, to a selected list of clients, printed or novelty inserts advising the purchase of electric cars. Such inserts to be supplied by the Electric Vehicle Section or by the manufacturers.

Third, that each central station, in localities where electric vehicles are in use, employ in its new-business department a capable man to devote his time exclusively to building up the use of the electric vehicle in his territory; assisting the manufacturer in appointing dealers, then in developing and increasing the efficiency of such dealers; assisting in organizing garages or charging stations, the purchase of proper equipment for such places—that electric cars can be properly cared for and maintained.

Fourth, a money appropriation, from the National Electric Light Association, to be pro-rated amongst the electric vehicle manufacturers in proportion to the amount that each manufacturer would himself agree to spend for his season's national advertising, with the agreement that each manufacturer so benefiting would devote at least two-thirds of his copy to telling the merits of the electric, and one-third to specializing on his own make of car.

Resolutions were adopted, endorsing the suggestions made by Mr. Fairgrieve, and proposing also the employment of an electric-vehicle expert whose duty it would be to personally visit central stations and explain electric-vehicle possibilities to them and obtain their full co-operation.

Standardization an Important Topic at Tri-State Convention.

Standardization of accounting, operating and construction methods was strongly advocated at the concluding sessions of the Tri-State Water and Light Association of the Carolinas and Georgia, which was held at Macon, Ga., on April 17 to 19. The first day's meeting was reported in the last issue.

At the second day's session of the convention F. L. Parker, of Charleston, S. C., chemist of the South Carolina State Board of Health, presented a paper on "The Relation of Water Supplies to Disease." This was an able discussion and dealt with the various methods being used to purify waters from all sources. Following this paper and discussion there was submitted a proposed bill to enlarge the powers of the Georgia State Board of Health. This was referred to a committee which after some consideration recommended that the association indorse the bill as presented.

W. Rawson Collier, of the Georgia Railway, Light & Power Company, addressed the convention on "Standardization." Mr. Collier is one of the best informed men in that section of the country on electrical matters and his papers and reports are features of the Tri-State meetings. He said he had for a number of years been very much interested in gathering and compiling statistics covering the operation of public utility plants, particularly those supplying electricity and water service, and had found that, although he had secured a vast array of figures, it has been impossible, on account of the manner in which the figures were furnished, to make any comparisons or to draw any useful conclusions from such data. He also discovered that in a number of cities it was absolutely impossible to obtain any accurate data

regarding the operation of utility plants on account of the fact that the records were so indifferently kept and often so poorly preserved even after they were obtained. He had noted that the yearly reports of a number of utility plants were of such a nature that it was impossible for anyone reading the report to determine whether the plant was economically operated or not and equally impossible to determine if the plants were on a paying basis. It was with a view of remedying such mistakes that his paper was prepared so that within a few years some accurate idea as to the operating costs and the results of electric light plants and waterworks systems in Georgia, North and South Carolina, would be in the hands of the Tri-State Association.

Mr. Collier divided his subject into three headings, power generation, water pumping and distribution, and electrical distribution. Proper records of power production can only be secured by the use of accurate measuring instruments, records being kept on log sheets; every pound of coal should be weighed and coal fired should be checked against coal received. Accurate account of water consumed by boilers should be kept and it would be advisable to install steam-flow meters. Mr. Collier exhibited a log sheet that would fill the needs of water and electric plants. Boiler tests and proper calibration of electrical switchboard instruments were explained. Mr. Collier covered every detail under the three headings and concluded by saying that while for several years co-operation had been the slogan, now we are vigorously discussing preparedness. All movements combining these two important elements in order to be successful must include standardization. He urged upon the membership of the association united thought and action on this subject, as its importance increases as the organization grows.

Wednesday afternoon the water and light men were motored to the Macon water plant where a sumptuous barbecue was spread and devoured by nearly 200 visitors and home people. Editor W. G. Anderson of the *Macon Telegraph* made a happy speech to the visitors. More motoring followed and a forty-mile drive through the peach belt in the Fort Valley section was the delightful experience of the visitors. Refreshments were had at Fort Valley just before the start for home was made. Wednesday night found the visitors at the Grand Theater with Macon as the host.

On Thursday morning H. S. Jenkins, representing the Southeastern Underwriters' Association, delivered a paper on "Fire Protection," which covered every phase of the waterworks systems and showed a close relation existing between fire and water departments. The report of the Committee on Fire Protection followed the address and was adopted.

Thomas Fuller, of Atlanta, presented a paper on "The Early Development of Watt-Hour Meters." Starting with the patent issued to Samuel Gardiner of New York in 1872 he traced the development and improvements up to the present time, explaining the phenomenal growth in matters electrical. What may be expected in the future can only be imagined, but it is a safe assertion to state that meter production will keep pace with the industry.

W. E. Vest, of Charlotte, discussed the "Laying of Water Pipe. The convention went strong for standardization, purity of water supplies, and fire prevention as well as fire protection. It was a fruitful meeting and as for the entertainment feature—the association experienced much difficulty in securing words to adequately express its appreciation of the treatment and hospitality accorded.

The following officers were elected: President, J. E. Guilford, Macon, Ga.; first vice-president, W. E. Vest, Charlotte, N. C.; second vice-president, E. C. Morrison, Bennettsville, S. C.; third vice-president, Dudley Chipley, Columbus, Ga.; secretary-treasurer, W. E. Stieglitz, Columbia, S. C.

Charlotte, N. C., was selected as the next place of meeting, over four other cities asking for the 1918 convention. Twenty-seven new members were enrolled and a handsome loving cup was presented to the new president, J. E. Guilford, for having secured the largest number of new members during the past year. The president is a thorough business man and is secretary-treasurer of the Macon Board of Water Commissioners. The Finance Committee in reporting on the general condition of the association in a complimentary manner recommended that the secretary-treasurer be given a substantial reward. The electrical manufacturing industry had a strong delegation at the convention.

PACIFIC COAST SECTION PLEDGES SUPPORT TO GOVERNMENT.

First Annual Convention at Riverside, Cal., Considers Many Important Topics.

With an attendance of over 500, representing a membership which in three months has grown from 300 to 1419, the Pacific Coast Section of the National Electric Light Association held its first annual convention at Riverside, Cal., April 19 and 20. The membership comprises 51 Class A companies operating in California, Nevada, Arizona and New Mexico, this being the largest affiliated section of the National Electric Light Association now in existence. The features of the convention were the addresses of President R. H. Ballard, of Los Angeles, outlining the objects and purposes of the Section, which were unanimously endorsed, the Public Policy report presented by a committee headed by John A. Britton, of San Francisco, which defined the platform of the Section on broad and progressive lines and pledged its support to the Government in a resolution tendering the use of systems and service in protecting it in necessary transportation and manufacturing of war munitions, shipbuilding, raising of food stuffs and other necessaries of life. The Commercial and Engineering Sections completed an enormous volume of work of permanent value.

At the first commercial session on April 19 there were papers on Rate Making, by W. G. Vincent, Jr., on Electric Cooking and Water Heating, by J. B. Black, and on Industrial Electric Heating, by A. E. Holloway. The second commercial session was held on April 20, at which papers were presented on Merchandising, by A. W. Childs, Highway Lighting, by E. B. Walthall, and on Commercial Organization, by E. B. Criddle.

Two engineering sessions were held during the convention, at which the following papers were presented: Standardization of Pins and Clevise Hardware for Suspension Insulators, by L. M. Klauber, High-head Francis Turbines, by J. P. Jollyman, Joint Pole Construction, by J. E. MacDonald. Fuse Protection of Transformers and Branch Lines, by C. E. Cunningham, and Operation of Steam-Turbine Standby Stations, by G. D. Morgan.

Address of President Ballard.

Marking an epoch in the industrial and commercial development of the West and Southwest, Pacific Coast Section of the National Electric Light Association convenes for its first annual meeting. Here we see the realization of our long treasured dream—the formation of an association in this section of the country which, while embracing the ideals and underlying principles of the National Electric Light Association, also provides means for the proper application of those principles to our special conditions. Not until the National Association's convention in San Francisco did the conception begin to take definite shape. On that occasion the concerted effort of western representatives resulted in greater recognition of western interests in the councils of the National Association and at the same time gave the needed impetus to make the Pacific Coast Section an accomplished fact. Organization was perfected at a meeting held in Los Angeles on January 6, 1917, and the enthusiastic welcome accorded the Pacific Coast

Section in all fields of its activities is the best evidence of its present need and future usefulness.

It is but natural that outside of our organization there has been considerable speculation as to our purpose and aims. In other words, what and why is the Pacific Coast Section? Is it to combat municipal ownership—to resist regulation—to create or foster illusionary ideas regarding the duties and responsibilities of its members in their capacities as public servants? Does it embody ideas in conflict with the accepted principles of constructive economic and industrial development? What is it and why?

Briefly, the object of the Association, as stated in its constitution, is to promote the interests of its members, establish cordial and beneficial relations with the public and kindred associations and advance scientific and practical knowledge in all matters relating to the industry. In promoting the interests of its members, the Association is encouraging the development of the electrical business as it directly affects its members.

One of the functions of the Section is to serve as a clearing house for the ideas and experiences of its members. Instances are constantly arising where the larger companies must go to the smaller companies for ideas, suggestions and assistance in certain matters and, perhaps in more frequent cases, the smaller companies seek counsel in their problems from the larger companies. The advantage of a centralized and accessible source of information, where the experiences and problems of all companies, both large and small, are constantly being collected and arranged for quick reference, is obvious and we have now such a source of information and bureau for the interchange of views between members in this organization.

This organization stands emphatically and unequivocally for closer relations and broader understanding between the utility companies and the public and will work unceasingly to that end. It will encourage educational, co-operative and harmonious action among its members, and while the officers and committees cannot do more than suggest policies to member companies, they can emphasize the principles of the National Electric Light Association, which include the full performance of duty to the public in providing good service at reasonable rates, with liberal extensions into new territories. The Pacific Coast Section will lend its assistance and influence to promote amicable relations between the electrical industry and the public, and at all times co-operate with the regulating bodies.

Capital Requirements.

Capital investments of Class A member companies of Pacific Coast Section now exceed $500,000,000, as part of the $3,000,000,000 invested by all Class A member companies of the National Electric Light Association.

With the ever increasing demands for electric service, utility companies must exert every energy to secure the capital necessary to meet the constant growth and this phase of the business is only now beginning to be appreciated even by those who have been directly confronted with this grave question. The great disparity in the requirements of capital between utilities and commercial undertakings is so marked as to at first thought challenge comparison. Speaking generally, a mercantile establishment can turn its capital four to eight times a year while a utility company requires four to five years to turn its capital once. It is thus apparent that utilities must be allowed a sufficient margin between earnings and expenses to pay a fair return on the money necessary to do business and not only must the return be sufficient to attract capital but every possible precaution and safeguard must be provided to assure the investor of the safety of his investment. This important phase of our business resolves itself into two factors; first, a fair rate of return on investment, and, second, protection of investments already made. Furthermore, a utility which, through wise, skillful and diligent management, has reached a point of such efficiency that it is enabled to improve its service to its consumers, to operate at a lower cost, and to more advantageously finance its requirements, should not be crowded into a position where it will be stripped of all the benefits of its performance, but rather should receive a recognition which would tend to put a premium upon careful, economical and efficient operation. The regulating bodies must eventually recognize that the utility which is most successful is the one which can best serve the public.

With the modern doctrine of concentration of production and unified system of distribution serving large areas with diversified demands, the solution of the much mooted question of municipal ownership will be worked out solely along sane and logical lines. Certainly, the solution is not through continual strife, with destructive competition or other equally unfortunate consequences. Harmony and concert of thought and action between utilities and municipalities are both necessary and advantageous. Many municipalities are served by companies giving good service at reasonable rates and performing their whole duty to the public at a high standard of efficiency as parts of links of systems operating throughout large territories surrounding the municipalities. It is quite obvious and beyond contradiction that the service furnished by these companies, keeping in mind that such service is adequate and reasonable, is of greater economic benefit than could possibly be given by plants which the municipalities might build to serve only their own local needs in competition with private systems.

Water-Power Development.

In California alone, the maximum potential water-power development is estimated at 3,500,000 horsepower, of which at the present time a total of only about 750,000 horsepower has been developed. Ninety-four per cent of the potential water-power development is located at sites where federal permits are required. In the Western states, water power development has been extensive wherever existing laws and want of laws have not stepped in to block the way, but in the past few years extensive steam turbine plants have been built instead of water power. The industry is in dire need of federal laws authorizing water power permits, suitable and adequate as a basis for large investment, to encourage development.

Public utilities are natural monopolies in the regions served and are recognized and regulated as such. Experience has taught that the usual result of competitive service is duplicated capital, upon which the public must inevitably, directly or indirectly, pay a return. The cry of "monopoly," or "tendency toward monopoly" in the development of water powers, however, is unfounded. None exists and none is threatened. If the entire development in the United States were in the ownership of a single corporation it would not constitute a monopoly of the available water power. Organization into large groups creates diversified investment and the ability to procure capital at minimum rates for extensive development. An important element of the cost of public utility service is the cost of money; and such cost, whatever it may be, must be considered by regulating commissions in fixing rates.

Cost vs. Rates.

Costs of materials, supplies and commodities of all sorts have jumped amazingly in the past two or three years, but a review over a longer period reveals the fact that there has been a constantly increasing level of prices, aside from the abnormal advancement in the immediate past. In the last sixteen years the average price of staple commodities has so increased that the purchasing power of a dollar has decreased almost fifty per cent. While these figures apply specifically to articles of food, they serve as a fair criterion of the condition existing in all commodities. The costs of raw materials of every description have shown a corresponding increase. Yet in the face of this the rates for electric service have been steadily falling. The decrease in rates has been in even

greater ratio than the increase in costs of other commodities and certainly development in the art of generating and distributing electricity has not alone brought about this condition. Indeed, the question may well be asked as to how it has been accomplished. The answer is that organization, efficiency and business development, creating greater use from present investment, are after all the most potential factors.

The election of officers resulted as follows:

President, H. F. Jackson, Sierra & San Francisco Power Company, San Francisco, Cal.

First vice-president, Samuel Kahn, Western States Gas & Electric Company, Stockton, Cal.

Second vice-president, E. R. Davis, Pacific Light & Power Company, Los Angeles, Cal.

Secretary, A. H. Halloran, *Journal of Electricity*, San Francisco, Cal.

Treasurer, A. N. Kemp, Southern California Edison Company, Los Angeles, Cal.

OHIO TRANSMISSION AND DISTRIBUTION ENGINEERS HOLD INTERESTING MEETING.

Committee Meeting and Plant Inspections at Canton, Ohio.

The Transmission and Distribution Committee of the Ohio Electric Light Association held a meeting at the Hotel Courtland, Canton, O., on the morning of April 18, with M. H. Wagner, of Dayton, presiding. Frank Howard, who superintended the construction of the new Windsor-Canton, 55-mile, 130,000-volt transmission line and the Canton substation, made an address of welcome. Two papers were presented by A. O. Austin, engineer of the Ohio Insulator Company, and R. L. Allen, engineer of the Archbold-Brady Company.

Mr. Austin reviewed recent developments in high-tension insulators. He said that the properties of such insulators have been well known for some time, but not too much was known about the actual conditions under which they operate. The large transmission systems have many problems not present in the small systems, because of their larger power capacity and more numerous points of support and therefore of hazard. The chief insulator problem now is not one of building a unit suited for the high voltages, since that has been quite well done, but one of insuring much better maintenance. There has been too rapid depreciation of certain insulators, which formerly was ascribed to electrical fatigue. Now this is known to be due largely to faulty manufacture, chiefly to porous and imperfectly vitrified spots in the porcelain, which are sources of weakness bound to result in failure. Mechanical reliability is now almost more important than electrical reliability, but in order to get mechanical strength does not necessarily mean very large and heavy insulators because frequently the larger insulators have been found to break down first. Mechanical strength is secured to a great extent by eliminating serious internal stresses, such as those due to unequal contraction when an insulator long exposed to the hot sun is suddenly cooled by a shower. The stress goes up in almost direct ratio as the diameter of the cemented parts. Sanding the surfaces to be cemented is very desirable as it permits a smaller cemented area and reduces the liability to mechanical failure. Strain insulators are a greater hazard than similar suspension disks. Extreme care is necessary in every one of the 25 to 30 operations that an insulator passes through in manufacture. The use of pyrometer recorders is making possible much better control of the firing and cooling. The successful insulator must be a compromise of numerous requirements. Improvements in suspension insulators all aim to reduce maintenance. Mr. Austin showed conclusively how increasing the number of parts in an insulator, especially of the suspension type, reduces very greatly the liability of its complete failure; by increasing the number of disks, failure of one does not reduce the factor of safety of the remaining disks to a dangerous point.

Mr. Allen discussed some features of the design and construction of transmission towers, which must take into account actual building conditions, such as the work being done by rough men in very difficult places and the finished work being hard to inspect. The line-construction specifications of the National Electric Light Association are practically standard. The wind pressure usually allowed for is 15 pounds per square foot of surface, which corresponds to 70 miles per hour velocity. The engineer naturally wants to build a line of maximum strenth, but the earning value of the line may justify not over a certain fixed charge, that is, limit its cost. Therefore the engineer must build the strongest and best line possible with the funds at his disposal. Consequently the design is usually a compromise. Most failures of transmission structures from mechanical causes have been due to poor foundations. Reliable foundations necessitate most careful study of local soil conditions and adaptation thereto. There still seems to be very great discrepancies on the part of many engineers as to clearance requirements between conductors. Sag calculations to take account of all possible elements of loading make very complex mathematical problems. The sag varies roughly almost inversely as the loading. Increased length of spans requires greater clearances to prevent short-circuits due to unequal loading caused by sleet, wind, etc. The strength of the line is almost directly proportional to the size of the wire and about inversely to the length of the span. All the way through the design, therefore, it is necessary to balance all elements of the problem to give the best working compromise.

ASSOCIATED MANUFACTURERS TO AID IN MOBILIZATION.

President Sheppard of Associated Manufacturers of Electrical Supplies Shows How All Can Aid.

More than 14 months ago, on January 25, 1916, the Associated Manufacturers of Electrical Supplies offered its services to the Federal Government at Washington to facilitate the mobilization of the resources of the American makers of electrical supplies. That devotion to our country's welfare, spontaneously offered when a great emergency seemed to be foreshadowed by world happenings, is only intensified by the actual National need which now summons us to supremely unselfish service.

The Board of Governors of the Association will consider immediately various ways by which this organized body of manufacturers can co-operate systematically and effectively with those in authority in the conduct of the war and in the control of domestic resources.

Organized service will save time, substance and effort. One simple illustration out of many that might be cited is stated by President R. K. Sheppard as follows:

"When 20 manufacturers can make a given article much needed by a branch of our public service, those 20 manufacturers can quickly increase their normal total output by operating jointly. Some may have what others lack, raw materials for weeks or months ahead, while those who lack the stock perhaps could put labor and machinery at work instantly if the materials were at hand. To most quickly utilize all the stocks, all the machinery, all the labor of those 20 manufacturers is a huge task for intelligent, generous men, for practical patriots.

"Individual manufacturers both can and will thus aid one another. But, our emergency should impel whole groups of manufacturers to plan together, pool their resources, combine or jointly re-arrange their facilities, apply their executive powers intensively and without jealousy, to perpetuate the freedom of our people and to extend liberty and justice to all those who cherish or may be groping towards 'government of the people, by the people, for the people.'"

Electric Power in Dry-Dock Operation

Construction of Dry Docks and the Application of Electricity in a South Chicago Dock—Use of Central-Station Service

Industrial Power Series—Article No. 197.

A DRY DOCK is a masonry, concrete or timber-lined basin connecting with harbor waters and having approximately the shape of a ship's hull, into which a vessel can be floated and which can then be closed and emptied so as to leave the vessel propped up on struts and blocks with the bottom dry and available for cleaning and repairs. When the vessel is floated into the dock and the water removed, either by natural or artificial means, it is called a graving dock, while, when the vessel is partially removed from the water by means of ways, and the rest of the water excluded as before, it is called a slip dock.

Keel blocks are laid along the center line of the dock for the keel of the vessel to rest on when the water is pumped out, and the vessel is further supported on each side by timber shores built on the steps or "altars" of the side walls, which, when constructed of concrete, have a facing of stronger concrete, to enable these altars to withstand the wear and shocks to which they are subjected. Steps and slides are provided at convenient places at the sides to give access for men and materials to the bottom of the deck; and culverts and drains lead the water to pumps for removing the water from the dock when the entrance has been closed, and to keep it dry while a vessel is under repair. Culverts in the side walls of the entrance or valves in the entrance gate enable water to be admitted for filling the dock to let the vessel out.

Before the advent of concrete most docks were built of rough stone faced with cut granite. In France and England, particularly, the old docks are very excellent examples of well coursed and bonded faces. Some of the earlier docks were built with rough stone with granite quoins and copings. With the introduction of concrete it took the place of the rough stone backing used in England, and in Germany concrete was adopted for the mass work of docks built towards the end of the last century. In the United States the original material used in dock construction was timber, except in the case of some of the earlier dry docks of granite in the United States navy yards, but with the more extended use of concrete it has been largely applied to dry-dock construction.

In the operation of dock equipment, electricity has largely come into favor during the last 15 or 20 years, especially as a distributive agent. Its merits of extreme cleanliness and the compactness of working parts, as well as the flexibility of supply, have recommended it as a source of power. While steam engines have usually been used in the past for the operation of pumping equipment of dry docks, present-day practice indicates the tendency toward electric drive. As a motive force electricity is able to discharge all the functions of steam for running machinery identical in character. And while steam power is rarely capable of centralization, electricity is admirably adapted to systematic distribution from a central source, and the cost of wire mains is much less than that of any corresponding pipe system.

Since steam is usually employed for the generation of electricity it cannot be contended that the use of the latter is more economical than the use of steam, but it can be pointed out that one large electric generating station, using steam-

View of the Pump House and Transformer Equipment at Chicago Shipbuilding Company's Dry Dock in South Chicago.

driven prime movers, involves less expenditure in fuel, repairs, maintenance and attendance than a number of steam engines, each with its special outfit and upkeep. Moreover, the electric generating plant finds additional use at night for lighting purposes. Electric power in its particular application

View of Pump House and Entrance Gate from Wall of South Chicago Dry Dock.

to dry-dock equipment has the advantage over steam or other kinds of power because of the simplification of construction and methods of operation of the pumping units. The use of central-station service involves numerous considerations in its application to dry-dock and shipbuilding operations, and these will be discussed later, after data has been given on the use of such service in a particular instance.

Largest Dry Dock on Great Lakes Operated by Electricity.

During 1915 the Chicago Shipbuilding Company, a branch of the American Shipbuilding Company, of Cleveland, O., erected the largest and what is conceded to be the finest dry dock on the Great Lakes. The dock was built at its yards in South Chicago, Ill., and can receive the greatest ships which float on the lakes and still leave room at bow and stern. It is 723 feet long in its center line, has an inside beam of 103 feet and has a normal floatage draft of 16 feet 6 inches, or 2 feet more than the light draft of any Great Lakes ship. The dock is built of solid concrete and fronts on the Calumet River about a mile from Lake Michigan, making it practically unaffected by wind, water levels and storms.

The operation of the dock is completely governed by electricity and central-station service is used, energy being supplied by the Commonwealth Edison Company, of Chicago, from its substation at South Chicago. During the construction of the dry dock a submarine cable was laid across the river to furnish power for some of the building operations and the service lines were made permanent for operation when the dock was finished. Energy is supplied at 4,000 volts, three-phase, 60-cycles. The lines feed through three 150-kilowatt transformers, erected on a pole structure outside the pump house, and which reduce the pressure to 220 volts for light and power.

Electrical Equipment of Pump House.

The pump house is located near the entrance to the dock and contains all the equipment for the electrical control. It is built of concrete, 24 by 30 feet, one story and basement. There are two main pumping units, each consisting of a 200-horsepower, 220-volt, squirrel-cage vertical motor driving a Wheeler 30-inch centrifugal pump capable of delivering 30,000 gallons of water per minute, and running at approximately 287 revolutions per minute at full-load speed. These motors are started independently and at the time of starting the pumps are operated under zero head, in which condition the motors are loaded to approximately 125 horsepower. They are controlled by automatic starters.

For the purpose of pumping out the water that leaks through the entrance gate when a ship is being repaired there is installed a 40-horsepower, 220-volt squirrel-cage vertical motor driving a Wheeler 12-inch centrifugal pump with a capacity of 4,000 gallons per minute, operating at approximately 690 revolutions per minute at full-load speed. This motor is controlled by an automatic float-operated switch, the latter device being stationed so that when the leakage-water level reaches a certain stage the switch is automatically closed to operate the motor-driven pump.

The pump tubes connect with a tunnel, 7 feet deep by 8 feet wide, that runs the width of the dock just inside the entrance gate. There are three openings from the floor of the dock into the tunnel, one 10 feet square in the center, and two, each 5 feet by 3 feet, at the sides, all the openings being covered with screens to keep foreign matter from entering the pumps. By way of explanation, it may be stated that the center opening is of large size to allow workmen more room in which to work on a rudder, ships always being placed so the rudder is immediately above this central opening. The screens are removed, permitting easy access for the removal of a rudder or for similar work.

The entrance gate, which is a floating caisson, is a steel structure, made up of riveted plates and bracing interior construction, in a shape very similar to a ship. When the dock is closed the ends and bottom of the gate rest against sills at the sides and bottom, the bearing parts of the gate being provided with wooden strips to make the joint as tight as possible. When a ship is ready for entry into the dock, the gate is floated by means of a 2-horsepower induction motor that operates to pump water out of the compartments in the structure. The gate is then floated out of the way, and after the ship has entered it is returned to the entrance and sunk into place by the admission of water through four 3-inch valves into the compartments.

After a ship has been centered so that it will come to rest on the blocks, pumping is started. With both large pumps operating it takes about 3 hours and 30 minutes to empty the dock, tests having shown an elapsed time of 3 hours and 6 minutes when a large boat was docked and 3 hours and 40 minutes for a complete pump-out. In the first case the energy used was 795 kilowatt-hours, and in the second case 1,080.

Pumping Out a Dry Dock—Discharge from the Motor-Driven Centrifugal Pumps.

The cost for energy is about $75 per pump-out, and about 20 pump-outs are made per year. Five 36-inch valves in the entrance gate are opened to admit water into the dry dock for floating a ship.

Service for lighting is supplied from the central-station company's mains, lamps being installed in the pump house and basement. There are 14 outlets installed on the coping of the dry dock, these being spaced about 100 feet apart. Flood-lighting units and clusters of 6 incandescents are plugged in for illuminating a ship being repaired at night.

The original plans for the construction of the dry dock called for the installation of steam-engine-driven equipment for pumping, and the engines were also to drive an air compressor, this form of power being used throughout the yards for small hoists, riveting hammers and other tools. It was believed that economies could be effected by the use of steam power, and the installation of a new plant at the dry dock offered an opportunity for the installation of additional steam equipment that would make the entire power installation adequate and complete for regular and emergency uses.

However, looking forward to the complete electrification of the yards, the central-station company was able to secure the installation of its service by offering a contract for the use of energy for pumping on its limited-hour schedule, during the off-peak periods. Other features of central-station service emphasized by the company were (1) reliability of service in the continuity of supply; (2) readiness to serve, having at all times full capacity for instant use; (3) flexibility, enabling the installation of additional equipment or a change of shop location; (4) elimination of generating plant investment, with accompanying fixed and maintenance charges; (5) utilization of space and the obviation of executive supervision.

The problem of providing additional air-compressor equipment was solved by the installation of a motor-driven machine in the pump house. This is an Ingersoll-Rand compressor belt-driven by a 152-horsepower squirrel-cage induction motor. This compressor is used as auxiliary equipment and is not operated when the dock is being pumped out.

The pumping equipment of a number of European dry docks of about the same size as the South Chicago dock is considerably larger, and the time for pumping out is correspondingly reduced, in one case being as low as 2 hours. The reason for not following European practice was that the installation and maintenance costs do not warrant the installation of the more powerful equipment.

The character of the service being intermittent—about 20 pump-outs a year—the demand charge for central-station service would be exceedingly high. In the plant in question the demand is only the capacity of the two main pumping motors, since the sump-pump motor and the compressor motor are never operated during pumping operations.

Associated Manufacturers of Electrical Supplies Remove to Larger Quarters.

On May 1, the general offices of the Associated Manufacturers of Electrical Supplies will move from its present quarters to much larger offices in the Forty-second Street Building, 30 East Forty-second Street, New York, N. Y. This change was made necessary by the rapid growth of the Association and enlargement of its varied activities.

Coincident with the notice of removal is the announcement by Charles E. Dustin, secretary, that the insulated-wire manufacturers have organized and appointed a committee consisting of LeRoy Clark, of the Safety Insulated Wire Company; Wallace Clark, of the General Electric Company, and Edward Sawyer, of the Atlantic Insulated Wire Company, who will handle the Government orders for the insulated-wire manufacturers and distribute them so they can be filled with the greatest possible dispatch.

Patriotic Nela Girls Turn Athletic Field Into War Gardens.

Seven acres of ground, lying at the foot of the hill of Nela Park, home of the National Lamp Works, Cleveland, O., will not be the scene of athletic contests for which it was elaborately prepared, because it has been taken over by employees of the lamp works, especially the young women, who have determined to do their bit in helping conserve the food supply of the country and promote the Cleveland City War Garden movement.

So enthusiastic have the Nela ladies become over the granting of this plot of ground by the management of Nela Park for gardening purposes that they armed themselves with picks, shovels, rakes and hoes, donned their overall costumes and assisted in the first operation of plowing and raking the ground for their miniature farms.

Somewhat over 100 gardens, 35 by 40 feet, will be tilled by 350 gardeners who have enlisted in this food conservation plan. To aid the war gardeners of Nela, National Lamp Works officials have organized a community store for supplying tools, clothes, seeds and locker space at a minimum cost. The gardeners have also received the promise that should they produce vegetables in excess of those required for their own homes, the remainder will be purchased at market prices by the Nela cafeteria.

As an incentive to diligence, prizes are offered for gardens making the best appearance and those showing the greatest production.

Employees of National Works "Do Their Bit" in Gardening Activities.

Speed Control of Polyphase Motors

Further Discussion of Methods of Speed Adjustmemt of Polyphase Induction Motors—Primary Control Through Series Resistance and Autotransformer—The Three Systems of Dynamic Control

By GORDON FOX

This is the last of two articles on this subject in which Mr. Fox discusses the different methods employed for speed control of polyphase motors, their distinctive characteristics, adaptability and comparative advantages. The first article, published last week, dealt with multispeed motors, cascade-connected sets and rheostatic control. This concluding article takes up the two common methods of primary control and the three systems of dynamic control with auxiliaries.

THE SLIP of an induction motor with squirrel-cage rotor may be varied by changing the voltage applied to the primary windings. The slip, at a given torque, varies approximately inversely as the square of the applied voltage. The line voltage may be reduced, to lower the speed, either by means of an autotransformer affording adjustable voltage, or by the insertion of resistance in the primary circuit. The two methods afford slightly differing characteristics.

Characteristics, Advantages and Disadvantages of Primary Control.

The torque of an induction motor varies as the square of the applied voltage. A reduction in applied voltage brings about a marked decrease in available torque. At half voltage, the maximum torque has but a quarter of its normal value. The possible range of speed variation is limited by the accompanying reduction in pull-out torque. An induction motor with high-resistance rotor exerts a better torque with reduced primary voltage than a motor with low-resistance rotor. It also affords better starting torque per ampere. For these reasons, motors for primary control are specially designed to have low magnetic leakage and high-resistance squirrel-cage rotors. The large rotor losses incident to this design make necessary the use of comparatively large, easily rated frames which are consequently expensive. Autotransformer control is more complicated and costly than series-resistance control, since the autotransformer connections must be switched off and on and cannot be short-circuited as with resistance control. Autotransformer control affords a higher efficiency than resistance control and takes less current but gives a poorer power-factor.

The comparative characteristics of rheostatic control and primary control with autotransformers and resistances may be studied from Fig. 7. The figure shows the speed-torque and speed-current curves for the three methods. Curves 1 give full-load torque at starting. With rheostatic control 100 per cent full-load current is taken, with autotransformer control the current is 140 per cent and with series-resistance control it is 235 per cent. For starting, it is evident that rheostatic control affords much better torque per ampere. Curves 3 show the same torque per ampere for all three methods of control. This is because the secondary resistance on this controller point with rheostatic control is equal to the resistance of the high-resistance squirrel-cage rotor. The curves also show that the speed regulation with rheostatic control is much better than with primary control.

The advantages of primary control are the use of the squirrel-cage motor with no secondary leads and the simplicity of the primary-resistance controller. The disadvantages are: poor speed regulation, low efficiency and consequently uneconomical motor, small range of possible speeds and rapid reduction in torque at decreased speed. Primary control is used in powder mills, for oil pumping and for such

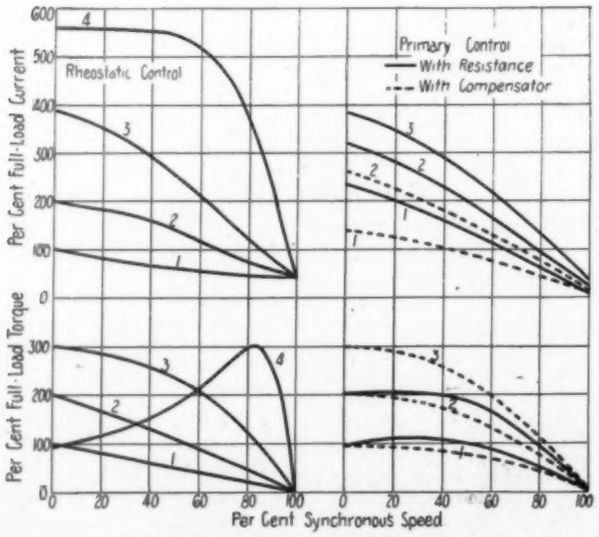


Fig. 7.—Comparison of Primary and Rheostatic Control.

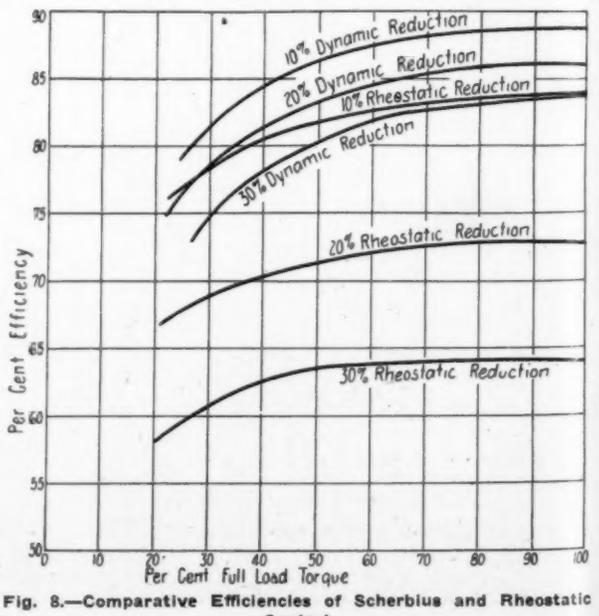


Fig. 8.—Comparative Efficiencies of Scherbius and Rheostatic Control.

cases where explosion or fire might result from a spark at the slip rings of a wound-rotor motor. Other applications of primary control are for trolley and traverse motors of traveling cranes, due to the lesser wiring, and as starting motors for large rotary converters or synchronous motors where the efficiency is of minor importance and simplicity is paramount.

General Theory of Dynamic Control.

The torque of an induction motor is developed by current in the rotor conductors reacting upon the primary magnetism. The primary magnetism of an induction motor remains practically constant. In order to develop various values of torque as demanded by an external load, the rotor current must vary. This is brought about in the ordinary motor by small changes in the slip, such that the voltage generated in the rotor circuit is varied and the current automatically adjusted to the load. The rotor circuit thereby has a generated voltage overcoming the rotor resistance.

Let us consider what will occur if, in addition to the rotor resistance, a counter voltage is introduced into the rotor, the value of this counter voltage being adjustable. A given torque still requires a given current and sufficient margin must exist between generated voltage and counter voltage to force the required current through the secondary-circuit resistance. The greater the counter voltage the greater the generated voltage required, hence the greater the rotor slip. It is thus seen that it is possible to vary the speed of an induction motor materially by introducing a counter voltage in the secondary circuit. Since the frequency of the secondary circuit is variable, dependent upon the slip, it follows that the frequency of the counter voltage must vary in like manner.

Dynamic control is the name given to all the methods of induction-motor speed control involving the use of auxiliary machines arranged to introduce a counter voltage into the secondary circuit and to transfer the secondary or slip energy of the main, wound-rotor motor back to the source of supply or to convert it to mechanical power and apply it to the shaft of the main motor. There are several methods in use. These may be classified according to the auxiliary equipment required, as follows:

Rotary converter-motor-generator.
Rotary converter-direct-current motor.
Alternating-current commutator motor

The Combined Rotary Converter and Motor-Generator System.

The layout and main connections for the rotary converter-motor-generator system are shown in Fig. 9. The operation is as follows: At starting, the main motor 1 is operated alone with the switch *A* thrown to connect the external resistance into the secondary circuit and the motor is accelerated in the usual manner by cutting down the secondary resistance. To place the auxiliary apparatus in service, the induction motor 2 of the motor-generator set is started by means of a compensator. The field of its direct-current unit 3 is reduced to zero so that the set merely runs light from the alternating-current lines. Normal field current obtained from an exciter is placed upon the converter 4, which is at rest. While the main motor is running light at full speed with small slip, the switch *A* is thrown over to disconnect the resistance and substitute therefor the alternating-current side of the converter. The latter starts to rotate very slowly, since it runs in synchronism with the slip of the main motor. The direct-current side of the converter is then connected to the direct-current unit of the motor-generator set by closing switch *B*. This completes all circuits and places the system in readiness for speed adjustment.

If the field of the direct-current unit 3 be strengthened, it will generate a direct-current voltage which is impressed upon the direct-current end of the converter. This increases the voltage at the alternating-current end of the converter and introduces a counter voltage into the secondary circuit of the main motor, slowing it down. This increases the slip frequency and causes the converter to increase its speed, but it does not affect the voltage ratio of the converter. The stronger the excitation of the direct-current unit, the greater the counter voltage introduced into the secondary circuit of the main motor. By adjustment of the field rheostat of the direct-current unit 3 it is possible to adjust the speed of the main motor for any desired rate below synchronism. With a given rheostat setting the speed of the main motor remains nearly constant, affording characteristics similar to those of an adjustable-speed direct-current shunt motor.

This scheme can also be used to increase the speed of the main motor above synchronism. As the field of the direct-current unit is weakened the speed of the main motor rises. If the field of the direct-current unit be reversed, the direction of rotation of the converter is reversed. The voltage applied to the secondary of the main motor is also reversed so that, instead of being a counter voltage opposing the flow of rotor current, it aids the flow. It is no longer necessary for the rotor to slip below synchronous speed to generate a voltage to set up the flow of rotor current. The rotor therefore speeds up above synchronism. In doing so it cuts the magnetism of the stator's revolving field in opposite sense from that existing below synchronism and thus generates a counter voltage. The more the field of the direct-current generator is strengthened the greater the voltage impressed at the slip rings encouraging the flow of rotor current. The higher then the speed must be in order that a counter voltage may be generated sufficient to hold down the rotor current to the value demanded by the torque of the external load.

The operation may be viewed in another manner if it is considered that, at speeds below synchronism, the frequency of the converter is subtracted from that of the main motor, resulting in a slip of the rotor below synchronism. Above synchronism the converter reverses its phase relations and causes the slip to become negative, so that the speed increases above synchronism.

There is a small range of speed very close to the synchronous value at which the rotary converter stands still and the main motor operates as a simple wound-rotor motor with secondary resistance corresponding to that of the secondary circuit through the converter and intermediate connections. This occurs while the voltage of the direct-current unit is nil. While the converter is at rest and when the direct voltage is being built up in either directions, direct current is delivered to the slip rings of the main motor since the converter does not convert while at rest. At this instant the main motor acts as a synchronous motor and comes up to exact synchronism. Over a small range of one or two per cent above and below synchronous speeds the operation of the set is slightly unstable in that speed adjustment is not exact.

Power and Torque Relations in Converter-Motor-Generator System.

We have considered the relations of the voltages and the currents in the various circuits, but have not studied the interchanges of power between the various machines. When the main motor is running below synchronism the rotor currents flow in opposition to the counter voltage impressed from the converter. They, therefore, represent negative power input or power output. Slip energy, wasted in resistance with rheostatic control, is thus transferred to the converter. It is here changed to direct current and transmitted to the direct-current unit which converts it to mechanical power. The speed of the motor-generator set is thus raised so that the alternating-current unit operates above synchronism (if of the induction type) and delivers energy to the supply circuit. The slip energy of the main motor is partially wasted in the resistance of its secondary circuit, but most of it passes

through the auxiliary machines and is returned to the supply lines. When the set is operating above synchronism the rotor current and slipring voltages are approximately in phase and represent power input. In this case the alternating-current unit of the motor-generator set operates as a motor. The direct-current unit runs as generator and delivers, through the converter, the energy which enables the main motor to run above synchronism. The proportion of the energy supplied through the auxiliary equipment depends upon the margin of operating speed above synchronous speed. The amount of energy received by the auxiliary equipment from the main motor operating below synchronism, depends upon the slip.

It will thus be seen that this system is a constant-torque proposition. Below synchrononous speed a given input to the main motor is partially converted to mechanical power and partially returned to the supply lines. At approximately synchronous speed, most of the input is converted to mechanical power, the losses alone being deducted. Above synchronous speed the auxiliary equipment aids in driving the main motor shaft. The mechanical horsepower output thus varies approximately directly with the speed.

The apparatus used for a dynamic-control installation as above described is practically all standard equipment. The main motor is of the ordinary wound-rotor type. It is possible to furnish auxiliary equipment to provide dynamic control for any ordinary wound-rotor motor. The rotary converter is often a standard machine wound with the same number of phases as the secondary of the main motor. Its frequency and voltage rating must be consistent with the values obtained from the secondary of the main motor under operating conditions. A 25-cycle converter will often be suitable for use in connection with a 60-cycle main motor. The relative capacity of converter and main motor depends on the speed range desired. For a range of speed 30 per cent above and below, the capacity of the converter will be about 30 per cent of that of the main motor. The capacity of the motor-generator set bears a like relation. Since this set may operate at any rotation a high-speed set is used to reduce its cost. The direct unit is an ordinary direct-current motor. Its shunt field is separately excited from the same circuit as that exciting the converter. In some cases it is found desirable to furnish a compound winding for the direct-current unit. Increase of load on the main motor increases the load on the auxiliary equipment. This increase causes a strengthening of the series-field excitation of the direct-current unit and thus aids in maintaining the speed of the main motor. The speed regulation of the main motor may be varied by adjusting the series field of the direct-current unit. The alternating-current unit of the motor-generator set may be either a synchronous or an induction motor. The induction machine is more stable and simpler.

The Combined Rotary Converter and Direct-Current Motor System.

The rotary converter and direct-current motor type of dynamic control is similar to the system just explained with the exception that the motor-generator set which returns slip energy to the supply system is replaced by a direct-current motor mounted on the common shaft with the main motor. Fig. 10 shows the layout and main connection of this system. The direct-current motor 2 converts the slip energy into mechanical power at the main shaft. The operation and speed adjustment is similar to that of the converter-motor-generator system. The direct-current motor must be equipped with a comparatively strong series field. In the motor-generator system it will be recalled that the speed of the direct-current unit was approximately constant. In this second system the direct-current motor speed drops as the main motor slows down. In order to maintain the counter voltage at the sliprings the excitation of the direct-current machine must be correspondingly increased.

It will be seen that this system of dynamic control is essentially a constant-horsepower proposition. The total input, minus the losses, is converted into mechanical power at the main shaft. Near synchronous speed the main motor delivers most of its input at the shaft. At reduced speeds the direct-current motor adds its torque to that of the main motor. At speeds above synchronism the torque of the direct-current unit opposes that of the main motor. The net torque thus varies with the speed, giving a constant-horsepower characteristic.

The direct-current-motor system of dynamic control is, in general, more costly than the motor-generator system. The main motor is usually a large, slow-speed machine. Since the direct-current motor is preferably mounted on a common shaft with the main motor, it runs at comparatively low speed and is therefore large for its rated output. The relative capacity of the direct-current machine depends, as in the previous system, upon the speed range to be covered.

Speed Control by Means of Polyphase Commutator Motors.

The commutator-motor method of dynamic control is applied in either one of two arrangements, the Kramer and Scherbius systems, respectively. The systems are similar to those previously mentioned, but the auxiliary equipment used is different. No direct-current machines are used and no converter is necessary. Instead, an alternating-current commutator is supplied to receive the slip energy from the slip rings of the main motor and to introduce a counter voltage into the rotor circuit of the main motor. An alternating-current commutator motor is a machine similar in general characteristics to the series direct-current motor. In the Kramer system the commutator motor is mounted upon the common shaft with the main motor and delivers the slip energy as mechanical power to that shaft. In the Scherbius system a separate motor-generator set is provided for returning the slip energy to the supply system in a manner similar to that previously described. The counter voltage of the commutator motor may be adjusted by means of an auto-transformer and through the use of a small exciter.

Relative Advantages and Adaptability of Dynamic Control Methods.

The Scherbius system is essentially a constant-torque proposition, since it returns the slip energy to the supply mains and subtracts it from the input of the main motor at reduced speeds. The Kramer system is essentially a

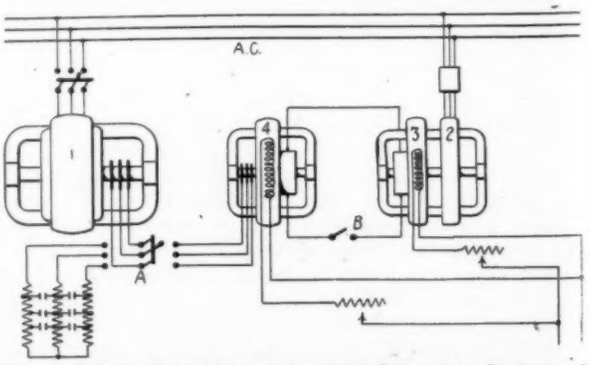


Fig. 9—Rotary Converter and Motor-Generator System of Dynamic Control.

constant-horsepower proposition, since it converts the slip energy into mechanical power at the common shaft and thus makes available increased torque at decreased speeds. The equipment for a Kramer system is generally more costly than that for a Scherbius system, since the direct-connected motor operates at the same speed as the main motor. A special design is frequently necessary for the commutator motor, to correspond to the speed and power rating of the main

motor. In the Scherbius system the commutator motor is independent, may run at any desired speed and may therefore be smaller in size and standard in design.

The preference between the rotary-converter methods and commutator-motor methods of dynamic control depends largely upon the particular installation. The rotary-converter method is at its best when used upon 60-cycle circuits. The small range of unstable speed adjustment which occurs at synchronous speed when changing from underspeed to overspeed operation, is less serious in 60-cycle machines. Also, with a 60-cycle main motor a 25-cycle standard converter can generally be used to handle the slip energy. With a 25-

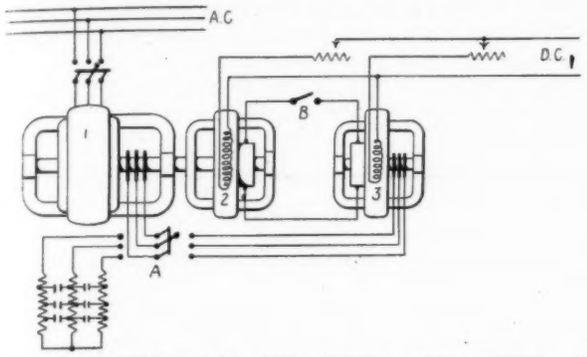


Fig. 10.—Converter and Direct-Current Motor System of Dynamic Control.

cycle main motor a special converter may be required. The rotary-converter method affords a wider speed range than the commutator-motor method and permits operation both above and below synchronous speed. Where a range is desired exceeding 25 per cent on 60-cycle motors or 50 per cent on 25-cycle motors the converter method is preferable. The commutator-motor method is more satisfactory in connection with low-frequency main motors and for moderate speed ranges involving small slip, since commutation is not satisfactory except with low frequency in the commutator-motor circuit. The rotary-converter method is generally used for the larger installations involving auxiliary equipment of 1,000 horsepower capacity and upwards.

Regarding dynamic control in general, it will be seen that it is applicable only to large units, because of the amount of auxiliary equipment required. For small units it would be equally simple to convert the original power to direct current and provide adjustable-speed shunt motors. Very large units involve power too great to permit of easy transmission and distribution or conversion.

The operation of dynamic-control sets is not complicated. High first cost is the main disadvantage. The speed-torque characteristics obtainable are similar to those obtained from direct-current adjustable-speed shunt motors. Dynamic control is the only method yet devised for securing satisfactory adjustable constant-speed characteristics from alternating-current motors. The higher efficiency of dynamic control as compared with rheostatic control is made evident in Fig. 8, which shows the efficiencies of similar motors using rheostatic control and Scherbius dynamic control. The largest field for the use of dynamic-control sets is in connection with steel-mill drives. They have also found some applications in connection with mine fans and other large motor drives.

ANNUAL MEETING OF WESTERN RED CEDAR ASSOCIATION.

New Officers Elected and Committee Reports Presented at Annual Convention.

The annual meeting of the Western Red Cedar Association was held at the Davenport Hotel, Spokane, Wash., on April 3, with a full attendance. President E. T. Chapin in his address reviewed the growth of the Association which was organized in 1906 with three members. At that time specifications covering poles were written and adopted and it is significant, Mr. Chapin said, that these specifications, with very slight changes, are still in effect. Referring to conditions during the past year, Mr. Chapin said that there is much to be thankful for. There has been a good demand for all cedar products and producers have a stock on hand adequate to supply any ordinary demand. Reference was made to the report of the United States Forest Service, which gave tabulated statistics showing the use of poles during the years of 1907 to 1915 inclusive. Mention was also made of the national advertising campaign adopted by the Association which has been very successful.

C. S. Lindsley, as chairman of the Railroad Committee, reported that the question of reducing the double load rate on poles to that of single loads had been brought before the Interstate Commerce Commission and a satisfactory adjustment was hoped for in the near future.

A motion was adopted providing for the appointment of a committee to arrange a series of comparative strength tests in Spokane of western red cedar and various other kinds of poles, including the different kinds of steel. It was proposed that the services of a competent engineer be secured to outline and conduct the experiments and that a representative of the United States Forestry Department and prominent engineers from all over the country be invited to attend.

The election of officers then took place and resulted as follows:

President, F. C. Culver, Sandpoint Lumber & Coal Company, Sandpoint, Idaho.

Vice-president, O. S. Hanson, National Pole Company, Spokane, Wash.

Secretary-treasurer, G. A. Clark, 709 Peyton Building, Spokane, Wash.

The new Board of Directors consists of F. C. Culver, president; O. S. Hanson, vice-president, and H. J. Searl, of Spokane, E. L. Clark, of Minneapolis, and M. P. Flannery, of Spokane.

CENTRAL-STATION MERGER IN MILWAUKEE.

Commonwealth Power Company Absorbed by the Milwaukee Electric Railway & Light Company.

The Commonwealth Power Company, operated in an extensive downtown district in the city of Milwaukee, Wis., under the management of O. M. Rau, has been purchased by the Milwaukee Electric Railway & Light Company.

At the time Mr. Rau became general manager of the Commonwealth Power Company, its gross receipts from downtown customers were less than $60,000. So rapidly did this business develop that within five years the receipts increased to $300,000 per year, and the power plant was increased with the addition of a 3,000-kilowatt turbine, and a large storage battery was installed to assure reliability of service.

A farewell banquet was given by the employees of the Commonwealth Company on April 18, at the Hotel Martin, at which 75 plates were served. Farewell addresses were made by a number of the men, and Mr. Feldkeller, in behalf of the employees, presented a solid silver case suitably inscribed to Mr. Rau on his retirement as general manager of the Company.

By the terms of the sale the employees were transferred in a body to the Milwaukee Electric Railway & Light Company, where they will be distributed to the various departments. The office of the company will be abandoned as soon as the affairs of the company can be closed.

For the immediate future Mr. Rau will have his office in the Public Service Building, and act in a general capacity for the Milwaukee Electric Railway & Light Company.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Principles of Advertising Outlined by Experts for Central Stations.

A dissertation on the principles underlying successful publicity has been sent to company members of the New England Section, N. E. L. A., by the Advertising Committee, Willard Hall, chairman. It contains these suggestions:

"In any sale there are four mental steps. First, the attention of the person is attracted, then the interest awakened; this changes to desire, and finally comes the resolve to buy. Between these four mental steps the prospective buyer must be educated. You have to tell him just as many reasons as possible to lead him along the journey from attention to resolve.

Sometimes attention and interest may be almost simultaneous, with resolve slower in coming. Again, the four steps may be passed through in a very short time. The mental states when one arrives at the various points are about as follows:

"Having secured his interests we may rest our oars for a moment while we study the individual needs of our prospect. Here is where personal selling comes into its own. The salesman acquires an intimate knowledge of his prospect's conditions and is able to give him individual attention and service which finally brings our prospect to the point of desire.

"Theoretically, desire and resolve should be simultaneous, as is frequently the case with attention and interest, but conditions, over which the seller has no control, sometimes prevent this instantaneous action. The price of the article may seem too high, or perhaps he's hard up. Sellers try to overcome this point by selling their product on the partial-payment plan,—such as books, electric ranges, vacuum cleaners, etc.

"Summing up, the educating process that constitutes a sale and which changes one mental state into another until the point resolve is reached, can be condensed as follows:

"Between attention and interest we must have sharp, quick action, but our arguments or truths may be of a general nature. From desire to resolve is but a short step, one usually merging into the other without effort, unless financial obstacles impose. But between interest and desire is where the long, hard pull is apt to come: Where the why, the what, and the wherefore; the individual application of our product, the best arguments of our salesman (be he in print or in person) must be brought logically and forcibly before our prospect."

Kansas City Company Establishes Three-Cent Cooking Rate.

The Kansas City Light & Power Company, Kansas City, Mo., will put into effect May 1 a cooking rate of three cents. This will become operative on the same day as the new schedule fixed by the Public Service Commission and accepted by the company. The cooking rate is entirely voluntary by the company; it was not mentioned in the findings of the Commission.

The company will measure the energy used for cooking on a separate meter. A minimum of 80 cents on the cooking schedule will be required; the present minimum on the lighting rate is 50 cents.

The company announced that because of the reduction made by the Commission, it was necessary to increase consumption of electricity, as well as to reduce expenses by economical management. The first day after the cooking rate was announced, the company retail store was flooded with customers for stoves.

A Plain Statement!
TO CONSUMERS OF ELECTRICITY:
This Company has, in obedience to the recent orders of the Public Service Commission, prepared and will on next Tuesday, April 17, file its schedule of rates, effective May 1, 1917.
The Company, in good faith, has endeavored to meet the requirements of the Commission, and feels that it has done so.
If injustice has been done to any class, or individual consumer, it will be the policy of the Company to promptly correct the injustice.
A few illustrations, or comparisons between the former and the new rates, are submitted:
RESIDENTIAL CONSUMERS
FORMER RATE:
Average Five-Room House.
NEW RATE:
Eleven cents per kilowatt-hour for the first three kilowatt-hours per room per month.
Five cents per kilowatt-hour for all current in excess of 3 kilowatt-hours per room.
Yearly bill $15.85
Net rate, per kilowatt-hour, including lamp renewals 9.6c
Eight cents per kilowatt-hour for the first 3 kilowatt-hours per room, per month.
Five cents per kilowatt-hour for all current in excess of 3 kilowatt-hours per room, less 8% discount.
Yearly bill $12.21
Net rate, per kilowatt-hour, including lamp renewals 6.6c
SAVING, $3.64 per year.
AS TO FUTURE RATES:
When the number of customers shall equal 60,000, residential rates will be reduced to 7c gross per kilowatt-hour, average net, 5½c per kilowatt-hour.
When the same shall equal 75,000, residential rates will be further reduced to 6c gross per kilowatt-hour, average 4.5c per kilowatt-hour.
A NEW COOKING RATE
Three Cents Per Killowatt Hour, Separate Meter, Minimum Bill 80c Monthly
For the present this is experimental, but it will not be increased, and a substantial reduction is promised as the business increases.
The Company has made an additional investment, exceeding One Million Dollars to meet immediate requirements, and is preparing its plans and estimates for the early construction of a large central power plant, the cost of which will exceed Six Million Dollars, which, when completed, will justify the expectations and warrant the promise that electrical current for all purposes—Lighting, Heating, Cooking and Power—will be furnished to the people of Kansas City at less cost than any city of like character in the country.
For information regarding service installations, or rates, call or write the Sales Department.
Complaints and Suggestions given courteous and prompt attention at all times.
KANSAS CITY LIGHT & POWER COMPANY
Bell Phone, Grand 60. Home Phone, Main 60

Advertisement Announcing New Rates.

An announcement regarding new rates was published in the papers and shows the good faith of the company, which has repeatedly inferred that if electricity could honestly be furnished any cheaper than its own rates, it would make such lower rates. The present announcement is expected to have some effect on the local agitation for a municipal plant.

ELECTRO-CULTURE AS A CENTRAL-STATION POSSIBILITY.

By F. S. Fletcher.

Food prices are soaring throughout the land; many so-called staple products being almost unobtainable are bringing hardship and suffering to many. While the masses strike and parade in demand for more and cheaper food the politicians demand embargoes and the government investigates. Meanwhile the farmer claims that he cannot cope with the demand because farm labor is deserting the farm for pleasanter, better-paid fields of endeavor; that his soil needs enriching; that the demand far exceeds the available or visible supply.

One, if not the chief cause for the present unprecedented demand for food is that America has been the greatest source of supply to warring Europe. But long after the war is over the cry for food will still persist. It will be years before the fertile fields of Europe can regain their fertility. The soils, once rich and verdant, are now strewn with rotting carcasses and rusting metals; the rich top soil has been plowed up by high-explosive shells and mixed with lime and stone and clay; deep pits and holes have been torn and rent that have filled with water. It will be years, perhaps a generation, before Europe can revert to its post-bellum agricultural prosperity, and until then it will look to America for a large portion of its food. What are we going to do to cope with this demand, that may increase rather than relax when hostilities cease? Already the supply falls far short of the demand, a demand not long sustained. Between 1900 and 1910 our population has increased 21 per cent, while our production has increased but 10 per cent, and our beef production has fallen 32 per cent. But we are eating more than ever before and other nations are demanding food of us. No wonder prices soar.

Perhaps it is natural that we should turn instinctively toward the transmission lines that traverse the agricultural districts, for these lines have already done much to make intensive cultivation possible, increasing the production of the soil, increasing land values and bringing in their wake prosperity. But the rural transmission lines can yet do more in serving the community, the nation and the utilities operating them. The rural transmission lines make possible electro-culture upon a vast scale wherever the transmission lines go.

Electro-culture, the electric stimulation of plant life, is a branch of agriculture and applied electricity that is crowded with absorbing interest, fascinating development and pregnant with the promise of economic results at once revolutionary and epoch-making. If proved economically practical upon a commercial scale electro-culture may be expected to go a long way toward solving the high cost of living, overcoming the labor shortage in the rural districts, and preventing the food famine that is coming appreciably nearer. By electro-culture intensive cultivation is made possible, thereby increasing the visible supply of vegetarian produce; it improves the quality of the produce and shortens the time required to grow it, thus bringing prosperity to the land owner, the farmer and the transmission line and railroads within the territory, and to the whole community.

The application of electro-culture to plant life is not new. It is old, for as far back as 1783, which is a long time in the electrical world, attempts were made to influence plant life by electrical means. Since that time many modes of electro-culture have been tried with widely varying results. Subjecting plants to atmospheric electricity was the first tried, while later came the artificial light from incandescent and arc lamps, the passage of current from an external source through the soil from two electrodes buried in the earth; the use of the soil as an electrolyte for two electrodes of different metals, comprising a voltaic cell; and, lastly, by the production of a silent discharge or glow from antennae placed above the plants. Plant life is at best a complex subject containing many variables beyond man's control. Plant growth cannot be standardized because seeds and soil have different and variable fertility, cold snaps and droughts come and go and thus throughout the many experiments carried on by many individuals the results obtained are often contradictory, sometimes negative, at other times pleasing, and then again worthless or doubtful.

What Past Experiments Demonstrate.

Among the latest and probably among the most reliable experiments are those carried on by Newman in conjunction with Sir Oliver Lodge. These experiments have further interest in that they represent conditions approaching a commercial undertaking, since 11 acres were subjected to electro-culture. At first Newman used a small Wimshurst machine, but later a mercury-arc rectifier furnishing 100,000 volts direct current which maintained a silent discharge from a network of antennae placed 16 feet above the surface of the earth and covering an area of 11 acres. The height of the antennae above the ground is such as not to interfere with persons below, and thus at once removes a very strong objection. Newman found that by means of electrical stimulation he could obtain earlier ripening of wheat by three to four days, with a yield 29 to 39 per cent greater, depending upon the kind of wheat used, and that sold 7.5 per cent higher than the wheat not subjected to electro-culture. Other cereals and vegetables showed similar results, some an actual increase of 50 per cent. Since that time Stahl, using 250,000 volts, direct current, has obtained similar results, also many others.

While the effect of electro-culture has been in some instances disastrous, due to carelessness or extreme measures, reliable data exist that justify the assertion that electro-culture opens up a vast field for serious work, for not only hastening growth, but superior and much greater yield, that brings bigger market receipts because of the greater quantity and better grade. Another fact that the experiments of independent investigators have brought out is that electro-culture not only stimulates and improves plant life, but it also acts to a very noticeable extent as a germicide, a matter that warrants special attention in those sections of the country that are visited regularly by devastating blights that ruin crops and bring hardship and loss to the growers. There is yet another fact of passing interest. Electro-culture seems to have proved itself less beneficial and even harmful, when applied during the heat of the day and in intense sunshine, than when used at night and in air somewhat humid. Rather than being a fact to be regretted this should be a pleasing phenomena to the central-station company for it suggests that electro-culture may offer an effective way of increasing the night load and filling in the valley in the load curve between darkness and dawn without in any way taxing the capacity installed.

Plant life may never permit the repetition of exact results, but it opens up a promising field for greater yields per unit of land, for hastening the time of harvest and increasing the quantity and quality of the crop. Experiments have proved that, but on a small scale. This matter is not broached in a flippant mood, but in all earnestness. If it is possible to materially increase production and the nation's supply of vegetables and farm produce in the face of a labor shortage by electro-culture it should be tried. The electric stimulation of plant growth is no longer a subject of purely academic interest, but one of vital importance economically to the producer and consumer if proved practicable upon a gigantic scale. Never was time more opportune than now for those able to tackle this matter. The utility delving into this branch of applied science wherever chance offers along its rural transmission lines is not only magnanimous in that it is working in the interests of the nation and of the whole agricultural world, but it is wise, for in so doing it may earn its own reward.

ELECTRIC TRUCKS ARE SERVICE VETERANS.

By Arthur Williams.

The electric seems to be the vehicle that will ultimately handle almost all city delivery. Heavy transportation also is capably managed by the electric. Many furniture moving and storage companies use it exclusively, and have done so for many years. A 10-year record, such as is held by the electric van of one storage concern speaks doubly well for this type of vehicle when the small repair bills are also taken into account. This particular company has added to its equipment since 1907 by the purchase of seven 3.5-ton cars, and two 2.5-ton electric cars, and given up its old horse-drawn and gasoline vans.

With records of continuous service extending in some cases as far back as 18 years, the electric delivery fleets of New York are the veterans of the commercial car industry. No type of delivery equipment even compares with the storage-battery vehicle in the matter of length of service. While the 18-year old fleet is one instance, there are many trucks whose period of service is 10 years and five-year old installations are a frequent occurrence.

The oldest fleet is that of a Fifth Avenue jewelry manufacturer, the cars having been purchased in 1909. A neighboring department store used, until recently, cars which were purchased at about the same time.

In the 10-year class mention should be made of the patrol wagon formerly stationed in the Tenderloin precinct. This car, still active, is the forerunner of four new electrics just purchased by the department. Another emergency car is the old ambulance of New York Hospital, installed in 1905, and still called upon for reserve calls though its burden is somewhat lessened by the five cars which have since been added.

For services which require short hauls with constant stopping and starting the electric is especially adapted. This can be well illustrated, for example, with bakery and express companies. One New York express firm has a large fleet which takes care of all hauling up to 35 miles. It was in 1908 that the first car in this fleet went into service, while every year since then has seen an additional number purchased until today the company owns more than 190. The older cars of the fleet are still doing their regular allowance of work.

Central-Station Company to Help Organize Branch of Red Cross Society.

The Louisville (Ky.) Gas & Electric Company has set aside a long-established rule in order to be of assistance in organization of a large Red Cross chapter in Louisville. Efforts are being made to create a chapter in Louisville with a membership of 20,000 or more, and in order to help in this work the company has agreed to distribute circular matter and application blanks for membership with its bills. The company is about the only one that reaches all of the homes and places of business of those who are desirable for members and likely prospects for membership. It has heretofore invariably declined to undertake anything of the kind, but in this case Donald McDonald, vice-president and general manager of the company, decided that the rule could be waived.

A Successful House-Wiring Campaign at Kokomo, Indiana.

With two special offers as features, the Indiana Railways & Light Company, Kokomo, Ind., is conducting a house-wiring campaign that promises to greatly diminish the number of unwired houses now in proximity to central-station service. There are at present 1,677 unwired houses in Kokomo and 5,200 wired.

Usually, in the ordinary house-wiring campaign, a good deal of the literature and even many personal calls by salesmen are wasted because of the incomplete records showing unwired houses. To overcome this feature O. M. Booher, new-business manager of the Indiana Railways & Light Company decided to have an accurate canvass made of the entire city and an up-to-date list compiled of all prospects for wiring. A convenient card file has been prepared, which also shows whether a house is occupied by the owner or by a tenant. To keep the list of maximum value, contractors are furnished with blanks, such as shown in one of the accompanying illustrations, and these are filled out for each residence wired, and returned to the central station so that the corresponding card can be taken out of the "prospect" file and inserted in a similar "customer" file.

Wiring Record
OF
Already Built Houses

Name of Contractor_____

Address of House Wired _____

Date_____

Signed_____

Blank Filled in By Contractor.

The campaign at present in progress, which is the fourth to be undertaken by the company, features two special offers: one for a four-room residence and one for a six-room resi-

MAIL THIS CARD

ELECTRICITY IN YOUR HOME

DO IT TODAY

Everybody knows about the convenience and safety of Electric Light in the home. Everybody wants it. Everybody knows the practical utility of Electric Irons and other electric household appliances. Everybody wants them. Sometimes folks find it hard to pay cash consequently they put off wiring and continue to deprive themselves.
In order that everybody can enjoy Electric Service in Kokomo, we are going to wire houses at special prices and easy monthly payments without interest (cash price same as payment price) beginning **APRIL 1ST, 1917**
FOUR ROOMS COMPLETE READY TO BURN, cord drops, 40 watt Mazda lamps, living room wall switch, fuse block and inspection. $12.50. $1.25 cash then $1.02 per month for 11 months. Easy prices and payments for additional room equipment.
For Your Convenience the Return Postal
INDIANA RAILWAYS AND LIGHT CO.

RETURN POST CARD

We have almost come to the conclusion of "kicking out" all of our old lighting relics and to
"DO IT ELECTRICALLY"
maybe we will do it this spring and maybe we won't. Any how we are willing to have your representative call and explain to us your house wiring payment plan. Mind you we will be under no obligation.

Name _____

Address_____

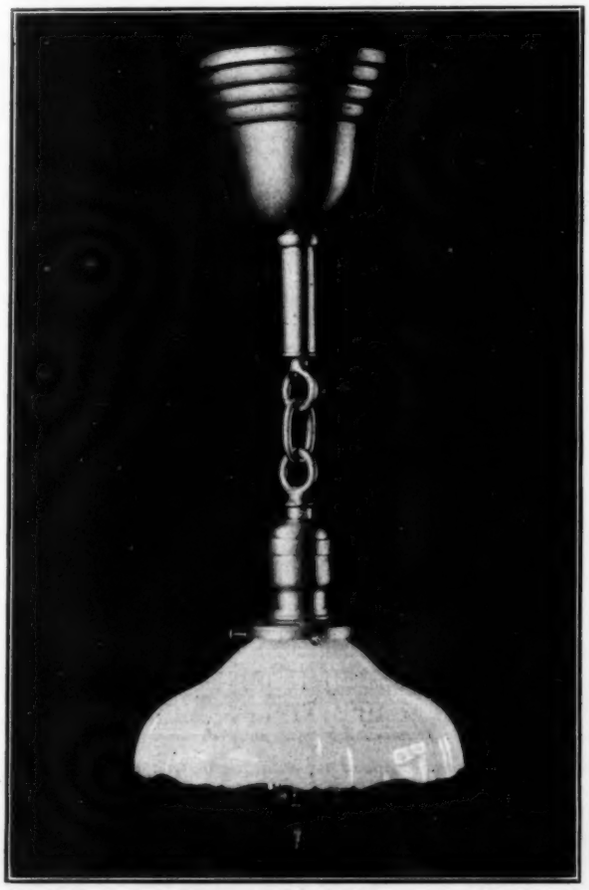
Two Sides of Post Card Sent to House Owners in Kokomo Campaign.

dence. The four-room offer provides for wiring for four outlets, one in each of the four rooms, with drop cords, 40-watt lamps and one wall switch in the living room for $12.50. The latter offer provides for wiring for six outlets, one in each room, four equipped with drop cords and 40-watt lamps and two with pendant fixtures equipped with white Alba shades and 60-watt lamps controlled by wall switches for $22. Other prices are in accordance with the following schedule:

	Price.
Extra Outlets	$1.25
Snap Wall Switches	.30
Flush Wall Switches (iron box 30 cents extra)	1.00
Three Way Switches	.65
Porch Ball and Ring	1.50
Flush Floor Plugs	1.25
Wall Sockets	.65
Wall Sockets Flush	1.50
One Light Round Pendant, White Alba Shade, 60-Watt Mazda Lamps	2.75
Two Light Round Fixture, White Alba Shade, 60-Watt Mazda Lamps	4.00
One Light Square Pendant, Shades and 60-Watt Mazda Lamp	3.00
Two Light Square Fixtures, Shades and 60-Watt Mazda Lamp	7.00
Cord Drop and Socket	.75
Meter Block	.90
City Inspection	1.00
Other Miscellaneous Charges	

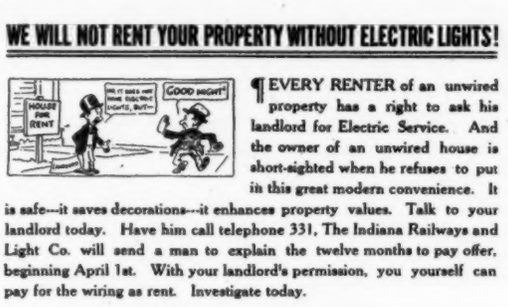
All work is done by local electrical contractors, four firms having agreed to the above prices. Customers are required to pay 10 per cent of the contract price when the work is completed and the balance in eleven equal monthly payments. The electric company carries the account, contractors being advanced the full price of the contract less 10 per cent.

In connection with the partial-payment plan the Indiana Railways & Light Company has adopted the scheme of issuing a pass book, very similar to a bank book, to each customer. This book is brought to the office each month and the payment credited to the customer. By this method every customer has an exact statement of his account and the company has never experienced any difficulty through errors or misunderstanding.



Unit Featured in Campaign.

The campaign was inaugurated on April 1, coincident with the nation-wide "Wire-Your-Home" Time. Modest newspaper space was used to announce the campaign. Main reliance for publicity was placed in post cards, two sets being used, one for tenants and one for house owners. Samples of both cards are shown herewith. The latter was sent with a self-addressed return card asking a salesman to call


WE WILL NOT RENT YOUR PROPERTY WITHOUT ELECTRIC LIGHTS!
HOUSE FOR RENT
GOOD NIGHT!
¶ EVERY RENTER of an unwired property has a right to ask his landlord for Electric Service. And the owner of an unwired house is short-sighted when he refuses to put in this great modern convenience. It is safe—it saves decorations—it enhances property values. Talk to your landlord today. Have him call telephone 331, The Indiana Railways and Light Co. will send a man to explain the twelve months to pay offer, beginning April 1st. With your landlord's permission, you yourself can pay for the wiring as rent. Investigate today.

Post Card Sent to Tenants.

with complete information. The former requested the recipient to telephone the company for further particulars. On April 21 over 100 return cards had been received and about half as many telephone inquiries so that the entire sales force of the company will be occupied for some time in following these leads. This method of advertising was only possible because of the card file which showed tenants and house owners separately. Use was also made of house-wiring literature supplied by the manufacturers.

The campaign will continue until May 15.

Atlanta Company Offers to Buy City's Excess Steam.

The Georgia Railway & Power Company has made a proposal to the city of Atlanta for the purchase of the surplus steam of the city crematory, paying for it at the rate of six mills per kilowatt-hour, the rate charged the city by the company for power for the operation of the water works. The company proposed to erect a generating plant near the crematory. The annual surplus of steam, it is stated, would generate 8,000,000 kilowatt-hours. The use of the steam has been discussed ever since the plant was built, it being planned at one time to use it as a central heating plant.

Exceptional Offer Made in Kentucky House-Wiring Campaign.

Free wiring and one month's free service are features of a house-wiring campaign which is being conducted by the Barbourville Electric Light, Heat & Power Company, of Barbourville, Ky. A. D. Smith, manager of the company, states the proposition as follows: "We will wire your home absolutely free—you furnish the material. You can buy it from us at actual cost, or you can buy it elsewhere—and we will do the work FREE. We will furnish the drop lines to the house and install the meter free."

House-Wiring Campaign at Clinton, Mass.

A three-room house-wiring proposition at $19 is being offered by the Clinton (Mass.) Gas Light Company, and a number of contracts have already been received, most of them with additional rooms. The offer includes one chain fixture with glass shade and Mazda lamp. All wiring is to be on one floor for the offer. One year is given in which to pay for the installation.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

PROTECTIVE LIGHTING FOR INDUSTRIAL PLANTS.

Valuable Hints Given in a Recent Bulletin of the Engineering Department, National Lamp Works.

Since our country has become involved in war, much attention has been given by the managements of industrial plants to protecting them, especially at night, from prowlers with evil intentions. Guards have been stationed about most plants of magnitude or whose work is of special importance to protect them, but to make these guards more effective suitable illumination of the immediate surroundings is necessary. Electrical contractors are likely to be called on to provide electric lighting equipment for this purpose and it is fortunate therefore that a very timely bulletin on this subject has just been issued by the Engineering Department of the National Lamp Works of General Electric Company, Cleveland, O. The principal recommendations of this bulletin are briefly given herein.

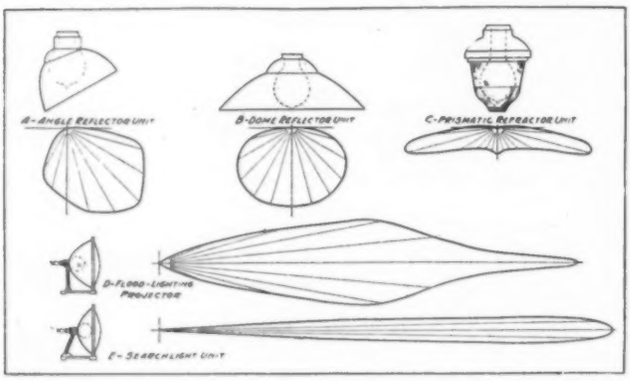


Fig. 1.—Types of Reflectors for Protective Lighting and Their Characteristic Distribution Curves.

Before any scheme of lighting is laid out it should be made certain that it conforms to the general principles of illumination, this being not only to make the lighting system effective, but also to provide it at minimum cost. Among the general principles that must be kept in mind are the following: An object is seen in detail by the light which comes from it to the eye and not by the light that comes from the light source to the eye. This means that the light should be thrown on the objects to be illuminated and that as little light as possible should come direct from the lamps to the eye of the guard or other observer. Where the light is not very intense it is possible to discern an object by silhouette effect, that is, by having it stand out against a more or less light background. This is not as satisfactory, however, as directly illuminating the object to be observed.

In all effective lighting glare must be avoided; glare is the result of having a light source that is extremely bright compared to its surroundings located directly in the field of vision. It is usually best overcome by shading the lamps with suitable reflectors and mounting them at a considerable height. Bare lamps should never be used unless mounted on exceptionally high elevations. Even then much of the useful light from bare lamps will be dissipated in non-useful directions. In order to use light from the lamps effectively reflectors of appropriate design should be employed to direct the rays upon the surfaces to be illuminated. Reflectors or projectors are of five general types as regards character of distribution. These general types are shown in Fig. 1, both with the shape of the reflector or projector and the character of the light-distribution curves they produce. It must be observed in this illustration, however, that the two lower projectors are not drawn to the same scale as the three other types shown above. Briefly these five classes are as follows:

A.—Opaque angle reflector, which gives a broad distribution of light principally directed to one side of and below the unit, thus making it suitable for illuminating fairly large areas.

B.—Opaque dome-shaped reflector, which gives a broad symmetrical light distribution suitable for illuminating fairly large areas below and all around the unit.

C.—Refractor unit, which gives a very broad symmetrical distribution suitable for illuminating very large areas with wide spacing distances between units.

D.—Flood-lighting projector, which gives a concentrated distribution wherein light is confined principally to a beam about 25 to 30 degrees wide, thus being capable of illuminating objects at a considerable distance.

E.—Searchlight, which gives a very high concentrated distribution with the light confined to an extremely narrow beam capable of illuminating comparatively small objects at great distances.

The reflectors and refractor A, B and C can be used with Mazda lamps ranging from 100 to 1000 watts in size. As a rule three sizes of these reflectors can be used for the wide range of lamp sizes referred to. With the units *D* and *E* it is usually necessary to employ definite sizes and types of lamps in order to secure the results desired.

In applying these general principles, two types of plants are considered. The first is a typical plant located in a city factory block, with building or buildings close to the street and occupying a considerable portion of the entire block. In this case it is practically necessary, if the street lighting already provided is inadequate, to install such additional lighting as will be confined practically to the width of the street. As a rule the lighting units may be mounted on the building itself, as indicated in Fig. 2, which shows a number of angle reflectors mounted directly at the cornice line so as to illuminate the street surface on each side of the building. By tipping the angle reflectors toward the building about 15 degrees, it is possible to make the reflector act also as a shade to

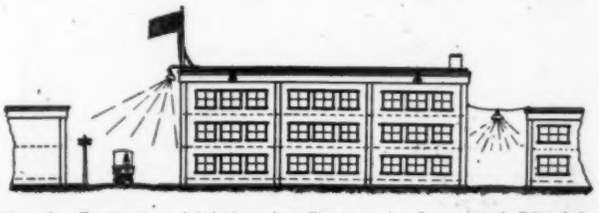


Fig. 2.—Protective Lighting for Factory in Congested District.

screen the lamps from direct vision and thereby eliminate glare which might otherwise be objectionable if the building were not very high. It should be noted in mounting such angle reflectors that they are installed not for flood-lighting the building itself but for illuminating the street or roadway about it.

In the case of narrow roadways or alleys between buildings or at gates or other entrances, it may be desirable to mount a dome-shaped reflector in the manner indicated toward the right in Fig. 2. In all cases it is very desirable to mount the lamps as high as possible, although no special advantage is gained by exceeding a height over 50 feet. At such heights a spacing of about 100 feet between units will provide amply uniform illumination with lamps no smaller than the 200-watt size. Where special precautions are required larger lamps may be necessary. If the lamps are to be mounted within 30 feet of the ground, it may be better to use the dome-shaped reflector B. In no case should a mounting height of less than 15 feet be used. The spacing distance should not exceed 2.5 times the mounting height.

In the case of plants in outlying districts that are not surrounded by other buildings it is possible to use a greater variety of equipment and it is not quite so necessary to be so particular about eliminating possible glare. The zone of light surrounding the plant need not be so closely defined and, in fact, may be extended some distance from the plant to considerable advantage. If such a zone of light is established about the entire plant it is not so necessary to light each building individually. Frequently it is possible to mount gooseneck posts on top of the fence which usually surrounds an industrial plant. In this case dome-shaped reflectors should be used and the lamps should not be less than 15 feet above ground. The spacing of units should not exceed three times their height. If the mounting height is 15 feet, a 100-watt lamp will be satisfactory. If the lamps are mounted higher, it is possible to use larger lamps at greater spacing, thus reducing the cost and increasing the width of the illuminated zone. If refractor units of the type shown at C in Fig. 1 are used, they should be at least 20 feet above ground and spaced not more than six times their mounting height. In this case lamps of 300 to 500 watts should be used. One advantage of mounting the lamps on posts secured directly to the fence is that in this way there is avoided the possibility of having dense shadows made by the fence which might furnish a lurking place.

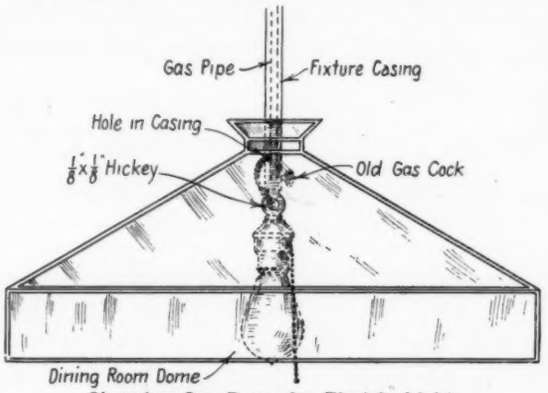
If an exceptionally large plant is to be guarded, projector units of the type D in Fig. 1 can be employed to considerable advantage. Since it is possible to illuminate long stretches with relatively few lamps these units should preferably be placed so as to direct their light in one general direction around the plant, and the guards in patroling the premises should walk in the same general direction so as not to face the bright light projected from the flood-light units. Units of 400 or 500-watt size spaced at intervals of about 200 feet and mounted at least 10 feet above the ground should prove satisfactory. At the points where especially effective patroling is necessary, special lighting may be required of the types already described. Flood-lighting units may also be employed by being mounted at considerable heights either at the corners of buildings or other conspicuous locations and directed so as to flood-light the entire surrounding grounds. The height, size and number of lamps required will depend upon the local conditions. In case it is desirable to use watch-towers overlooking the entire grounds, the type of lighting just referred to may be employed with the addition of a few searchlight units of the type E in Fig. 1, which can be used to supplement the fixed lights in penetrating unlighted areas or in directing the light on moving objects, etc.

While the various methods of lighting described are particularly suited for protecting industrial plants, navy yards, arsenals, etc., in times of special emergency like the present, they can also be employed to advantage for the safety lighting of such plants in normal times.

PUTTING AN ELECTRIC LAMP IN A GAS DOME.

By M. J. Moriarty.

In many houses tenants want to use electricity for gas-dome lighting in a dining-room where gas is provided. The



Changing Gas Dome for Electric Light.

electric lighting cluster is generally above the dome in the form of three or four chain pendants. In a case of this kind I carry a pair of wires down from the cluster, using the space between the gas pipe and the fixture tubing as per sketch. If the next tenant wants gas in the dome it is only a few minutes' work to make the change back to gas.

A SIMPLE PRICE RECORD FOR ELECTRICAL CONTRACTORS.

By Ed. M. Raetz.

After trying out various card-index and other systems for keeping cost of material, we finally adopted a 5 by 7.5-inch loose-leaf ring book with pages ruled and printed as per sample shown and find this to be convenient and easily kept up. The article and description is typewritten, the date, cost and selling price is filled out with lead pencil, which permits of ready revising without rewriting the whole page or destroying it.

With prices changing as they do at present, it is necessary that some ready means be employed to keep prices up

FOSTER-RAETZ ELECTRIC CO.
ELECTRICAL CONTRACTORS AND DEALERS
OFFICE AND STORE 117 S. MAIN ST.
STORE AND BATTERY DEPT. 332 S. BDWY. ROCHESTER, MINN.

PLEASE ADDRESS REPLY TO_____

Send us your latest discount sheet with your **NAME, DATE** *and* **ARTICLE** *quoting on.*

FOSTER-RAETZ ELECTRIC CO.

PER_____

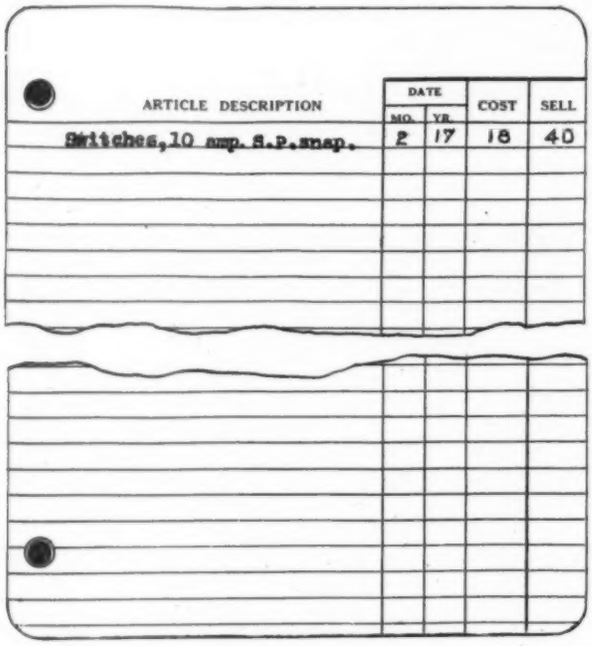
Post-Card Request for Discount Sheets.

to date. These leaves are filed alphabetically under subject matter, that is wire is under W; conduit under C, switches under S, etc.

While discussing the subject, the writer wishes to emphasize the necessity of keeping orderly records by the electrical contractor. It is a modern requirement that the contractor keep his office records of every kind in such shape that he can find any document needed in the shortest possible time, as this will save much time and money by avoiding errors. This is especially true of price records and discount

sheets. We use an 8.5 by 11-inch standard correspondence-size ring book, with one-inch rings, into which we file all discount sheets applying to standard goods, such as schedule material, conduit, wire, etc.

We have another file for general discount sheets which are not used so often, in which the sheets are filed under the manufacturer's name. We have a 3 by 5-inch card index for this, which is cross referenced so the article desired can be



ARTICLE DESCRIPTION	DATE MO.	DATE YR.	COST	SELL
Switches, 10 amp. S.P. snap.	2	17	18	40

Convenient Cost Record.

found under the manufacturer's name, also under the subject heading for that article. For instance, if we are looking for a water heater, we look under "Heaters, Water," etc., and find the manufacturers' names listed, then we refer to the manufacturers' catalogs for cuts and descriptions, then we look in the discount file for the latest prices. The discount files are kept up by going through the list regularly and mailing out a post card stamped as per sample.

The electrical contractor will find that if he keeps up his cost and discount files he will avoid most of the misunderstandings and the incident trouble so commonly caused by neglect of this matter.

Among the Contractors.

Buxbaum & Cooley, Seattle, Wash., dealers in electrical supplies, have changed the firm name to the George Cooley Electrical Company.

Walton & Doane is the name of a new firm organized at Lorain, Ohio, to conduct an electrical supply business and do contracting. The firm has opened a store at 109 Sixth Street.

The Gee Electric Company, Wheeling, W. Va., has 35 men at work in its motor repair and motor construction shop. Nearly 20 men are engaged on miscellaneous wiring work. The company's merchandising department is also doing good business in all lines of electrical appliances and supplies.

Russell & Company, electrical contractors, 56 West Forty-fifth Street, New York City, have been awarded the electrical work for the new building for the Buckley School at 120 East Seventy-fourth Street, New York City. This contract covers the wiring for light and power in galvanized conduit throughout; also includes an automatic clock system, telephones and fire-alarm system. The company has also been awarded the contract for approximately 3,000 feet of underground light and power cables on the estate of William F. Sheehan, Roselyn, L. I. About one half of this cable is for 2,500 volts, and the remainder is for 250 volts.

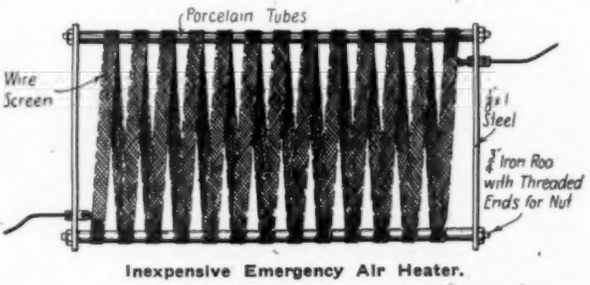
The State Electric Company, Canton, O., is engaged on several important contracts. At plant No. 4 of the Timken-Detroit Axle Company an extensive all-conduit installation is being made for numerous motors, generators, etc. In the large building of the Cleveland Axle Manufacturing Company that was recently destroyed by fire and is now being entirely rebuilt the State Electric Company is furnishing the motors and doing all the wiring (in conduits) for electrifying the entire shop; wiring for electric pyrometers is also being put in. A quite similar installation is being made for the Cleveland-Canton Spring Company's new building in which a total of 450 horsepower in motors is being put in. The company is also wiring one of the cottages for the State Hospital for Insane at Massillon, O. There was recently finished the wiring for an addition to the Canton plant of the American Sheet & Tin Plate Company, also a very complete electrical installation in the $500,000 residence of P. A. Myers at Ashland, O.

EMERGENCY ELECTRIC AIR HEATER.

By B. C. Zimmerman.

Recently we had occasion to make up an air heater for warming a certain room, since it was found impossible to secure delivery of a standard heater in time. It was made up in a simple and inexpensive way as follows. Ordinary window or door wire screening of a good grade was used for the resistor. It was cut into strips one inch wide and made up to a length of 100 feet. The frame was made as shown in the accompanying sketch, being made of two three-fourths-inch iron rods threaded at the ends for receiving nuts. The end pieces were one-eighth by one-inch steel flat bars drilled at the ends to slip over the threaded rods. Porcelain tubes were slipped over the side rods for insulating them. One end of the resistor wire ribbon was fastened and then the ribbon wound around as shown and the other end also fastened by wire. Where the ribbon passed over the tubes a piece of screen ribbon was first wound underneath and clear around the tube; this was to give added current-carrying and radiating surface at these points so as to prevent overheating and possible cracking of the porcelain tubes. The leads were No. 12 wire and passed through insulators in the end bars and were securely wound about the resistor ribbon near its ends so as to make a good electrical terminal connection.

This heater was connected to a 220-volt circuit and took about 4 kilowatts. It heated the room in which it was used quite rapidly. It was put on a separate circuit with cutout



Inexpensive Emergency Air Heater.

and knife switch. While in use the heater was placed on horizontal framework so as to support it at the ends in a horizontal position, thus permitting a very rapid circulation of air which accounted for the effective heating service it furnished. The heater was surrounded by a simple pipe guard connected to the supporting framework to keep anything from coming in contact with the heated element. Although very crude in appearance, the heater served its purpose well until warmer weather returned.

The Dealer and Storekeeper

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

A Unique Sales Plan for Vacuum Cleaners.

The installment plan has become a very popular form of merchandising. This is more or less true in regard to articles that involve a considerable outlay, and yet means to the purchaser a pleasure, or an easier or more certain way of accomplishing labor. The modern merchant finds this plan appeals strongly to the housewife, who, with her weekly or monthly allowance, will manage to purchase an article she much desires in the home, by paying a small amount down, and the balance in monthly or weekly payments.

At this season of the year when spring house-cleaning is a seeming necessity, it is natural that the home-maker should be interested in devices that aid her in this heretofore much dreaded labor. The electric vacuum cleaner commands her attention, and manufacturers are alert to the situation.

A timely and forceful sales plan has recently been introduced by a vacuum cleaner manufacturer whereby the dealer is materially assisted in selling the cleaner on the installment plan.

A special form of coupon-bond certificate is furnished the distributer with every cleaner purchased. The certificate is simply worded, and is in the form of a note, being a promise to pay, and is negotiable. To each certificate is attached a generous supply of coupons. Each coupon is blank, as far as the amount of payment and the time limit of the special offer is concerned, it being left to the discretion of the dealer to make his own terms.

The very forcefulness and timeliness of this plan is making it a success among dealers who have adopted this plan.

Original and Ingenious Ruse Secures Attention for Window Display.

Interest in a window display is an accumulative or compounding proposition. If the exhibit secures the attention of a few passersby, the curiosity of others is aroused, the audience is increased and the effect of the selling message is correspondingly greater. The accompanying illustration shows a display window in one of the electric shops of the Commonwealth Edison Company, Chicago, and is one of the most clever methods used for securing merchandising publicity that has come to the attention of this department.

Stacked up in rather disorderly fashion are a number of electric flatirons, some in cartons and others unpacked. In a timely way and not drawing upon the imagination too much, they serve to represent fortifications, such as a pile of sand bags, erected by soldiers in front of a trench. When one reads the sign "Fortify against the invasion of summer's hot days with an electric iron" and sees the irons and cartons that have toppled over into the "trench," he has no difficulty in picturing that an enemy shell has struck the fortifications.

Referring to the illustration, if the reader will note the iron in the lowest position in the center of the picture he will see that it appears as if it, in falling, had broken the window pane and was protruding over the window sill. Broken glass on the sidewalk directly under the iron and an apparently broken window front aid in making the curious onlooker think that an accident has happened to the display. Interested, though skeptical, he waits for some one to try and put his hand through the hole in the window, to find out there is none.

What was done was to take an iron and saw it in two, arranging to have about one-third protrude outside the window. This part was placed flush against the outside of the window pane, being fastened to the window sill by means of a small metal bracket. The remainder of the iron was placed in such position inside the window that it would appear that the iron was intact. Pieces of broken glass were pasted to the window in a careful manner to give the appearance that the window front had been broken.

New Idea in an Electric Iron Display.

That the display excited the curiosity and drew the attention of crowds can easily be understood.

However, the fact that the purpose of a display is to sell merchandise was not overlooked, and there is no question but that the selling message was given to every one who was attracted by the cleverness of the display.

Special Agent to Investigate South American Markets.—At the instance of the Bureau of Foreign and Domestic Commerce, Robert Grimshaw, special agent of the Bureau, proposes to visit early in June principal South American countries to investigate the markets there for certain lines of American manufacturers, and also to report on the methods adopted, in the various countries, for getting bids and awarding contracts for governmental and municipal supplies—especially electrical. Before his departure, he would like to learn from electrical and other manufacturers the principal difficulties that they have experienced in bidding on supplies for South America. His address is Room 409, Customhouse, New York City. In this connection attention should be called to the Museum in Room 109 of the same building, where there may be seen samples of foreign supplies in various branches of manufacture, bought in foreign markets and marked with the place of origin and the price in the countries where purchased by the representatives of the Bureau of Foreign and Domestic Commerce.

The Budget System in a Sales Campaign

Analysis and Foresight in an Electrical Jobbing Business by Use of the Budget Plan—From an Address by Harry L. Grant, Sales Manager, Western Electric Company, Before Chicago Association of Commerce.

BACK of almost every successful business there is a plan. Somewhere in nearly every successful business organization there is a man who has made up his mind that there are certain standards which should be hewed to, somebody who has made up his mind that the amount of money to be spent has some relation to the amount of money to be made, that the stock investment must bear some relation to the sales, that the bills and accounts receivable should bear a proper relation to the other elements of the problem. In loosely organized companies it is quite customary for this man to be looked upon as the common enemy of the salesman, of the advertising man and of the boosters generally; but in modern business, and particularly among the larger companies, the budget idea has come into vogue.

Sketched briefly, the budget plan provides that before we start into the year 1917, for instance, we should take stock of our past performance, we should analyze our past sales, analyze them in considerable detail for several years back. Based on this study, together with a study of the probable amount of business to be placed in our line and an estimate of general business conditions, we estimate how much we expect to sell during the coming year. Now we study our profits for several years back in the same manner, and, based upon the volume of business which we can reasonably expect to do, we will estimate our volume of profits for next year. Certainly if we knew fairly definitely that in the year 1917 we are going to make a certain amount, it is not a far cry to decide then that we can spend just a certain amount and no more. Similarly we can decide that we will conduct this business with a certain investment in merchandise and with a certain investment in bills and accounts receivable. In this manner we may estimate the several factors in the problem and decide in advance approximately what our performance for the coming year will be.

Typical Example of a Jobbing Business.

Before analyzing the method and results I want to drop back on some of the fundamentals of a commercial business. I am going to work out a typical example here, putting down the factors for a fair sized jobbing business. I hope the older men will forgive the elementary character of this study, but I believe a good many have not figured this out in the same manner I wish to present.

First of all, let us put volume of sales where it belongs. I don't want to say into the discard, but volume of sales is the least important of our considerations. Gross profit is the important factor, and I am reminded of the story of the manufacturer of pants and how, when he was asked the details of the cost of pants, he always started out, "Fifty cents for me." When due to competition the price dropped from $3.50 to $3 and to $2.50 per pair, and he successively was forced to change the details of his cost on each new analysis he started off, "Fifty cents for me." He had his eye on the main thing—the matter of gross profit.

But this is not the problem stated completely. I personally have known a merchandising business doing in one year a volume of over $2,000,000, and making a gross profit of $400,000, and during that same year spending $436,000 in expense. There you have a red entry to start with—a $36,000 loss. There is no chance for that sales campaign or that business to come through with a net return.

So then the next big item is the matter of expense. Having decided how much we are going to make, how much then can we spend? The profit which we are finally interested in is not the gross profit, but the net profit.

Practically every one knows that "per cent net profit on investment" is equal to the gross profit minus the expense (which is the net profit) divided by the investment, which in most merchandising businesses may be classified as the investment in bills and accounts receivable. Some businesses, of course, own their own stores and plants, so that plant accounting may become a part of the investment. Almost always, however, the system of accounting requires that plant accounting be handled as a rent item, so that plant expense is closed out each year into operating expense.

Now I want to work this problem out for a typical jobbing business. Let us make a number of assumptions. Suppose we assume a business doing sales per month of $100,000, and per year of $1,200,000. How much profit does it make on those sales? That factor varies considerably in different businesses. It varies among jobbers in different lines, but I have assumed an arbitrary percentage here of 16 per cent profit on the sales. If we have 16 per cent gross profit on $1,000,000 sales our gross profit for the year will amount to $192,000. Now how much can we spend? Certainly we cannot spend $192,000 or over that amount. I have assumed in this problem that we are going to spend 80 per cent of it. We will then put down our expense for the coming year as $154,000. Let me say here a word about this matter of gross profit and expense. Salesmen and sales managers are optimists. If the sales manager and advertising manager in many firms have too much right of way there is a tendency for them to wish to go out for volume of sales. Unless curbed they sometimes talk about getting volume this year and making their net return next year. That is a dangerous policy. I believe that we should settle down to the theory that we must make a proper net return this year.

Stock Investment.

Now how about our investment? First, stock investment varies tremendously in different lines of business. Among jobbers it is quite customary to have the manufacturers ship a certain proportion of the jobber's sales direct to the customer. This saves the jobber warehouse handling and investment in merchandise. I will assume in this particular case that the manufacturers will ship direct 30 per cent of the jobber's actual sales, or that we are going to ship 70 per cent of these annual sales through stock. Among retail merchants it is quite customary to ship a much larger percentage. I dare say many retail merchants ship 100 per cent through stock and probably most of them ship around 90 per cent Among jobbers some drop as low as 30 per cent through stock. Brokers ship zero per cent through stock. On this basis, if we are going to sell $100,000 per month, 70 per cent through stock, our sales per month from stock will be $70,000. Please understand that all these figures are arbitrary estimates; that they do not represent work of our company, but stand for general averages.

In different businesses the amount of stock carried in relation to the sales varies. Among jobbers it varies anywhere from one month's sales from stock to two months' sales from stock, or even higher. I am going to assume in

this problem that this particular jobber is carrying 50 days' stock; that is, stock expressed in dollars sufficient to handle 50 days' sales from stock. Our stock investment in this problem then would be $70,000 times 1.66 (one and two-thirds months), which is equal to $117,000. I am not going to complicate this problem by working out the stock investment at purchase cost instead of selling price.

Receivables Investment.

What should the receivables investment expressed in days be? Before I put down the figure let us think of it a minute. Certain metal trades have terms cash ten days. We are in the habit when we buy large shipments of lead and certain other metals to pay the invoice a week or more before the goods reach us in transit. That is a good standard for a lot of us business men to have in mind. The terms among many manufacturers and many jobbers are two per cent cash ten days, net thirty days. When we get the actual performance, however, we find that few are able to make that average. The collections of jobbers range anywhere from forty, fifty, sixty, seventy, eighty, ninety days, and some jobbers very much longer. In some businesses it is customary to give what they call "datings." I was talking to a business house this morning which is in the habit of giving six months' dating. Goods shipped in July are billed dated January 1, and on top of that, if the man does not take the cash discount on January 1, he can have sixty days more. Such a business as that would have an investment in bills and accounts receivable of 180 or 240 days' sales. This represents a very large investment in money. Personally I have always felt that such exceedingly long terms, and the dilatory collecting policy pursued in some lines has a weakening effect upon collections generally.

The ordinary jobber, we will say, however, carries an average receivables investment of sixty days' sales. In our problem we will therefore assume that our actual receivables investment will be twice the monthly sales, or $200,000. Now we can work out the problem. We have got here gross profit $192,000, minus expense $154,000, divided by the investment in merchandise, $117,000, plus the investment in receivables, $200,000. I have worked the problem out so as to save time and these conditions give us a 12 per cent net return on the investment. Probably in most businesses, over a period of years, that would be considered a satisfactory net return.

Now we can see in different businesses the effect of varying some of the factors. Take the item of expense. Suppose our sales department was enthusiastic and said, "Let us put on more salesmen; let us build for the future." Suppose instead of spending $154,000 expense we should spend $175,000 expense. That would change the net profit figure from 12 per cent to 5.3 per cent on the investment. So you can see how important it is to keep the item of expense down. If you take those six months terms we were discussing and make the receivables 180 days instead of sixty days, that again gives a net return of 5.3 per cent. If we are going to allow a six months dating of bills, and if we are going to have a satisfactory net return on the investment, we must increase the gross profit or vary some other factor. With the hazards we must assume in a merchandising business I do not consider a five per cent net return on the investment a satisfactory return.

Study of Sales Results.

So much, then, for a business which we will say came out last year with the factors as given. What are we going to do next year? That is, what are we going to do during the year 1917? We can take our sales studies as I have outlined briefly, study our actual results for four or five years, study results by classes of merchandise, by departments, by territories or other subdivisions. Suppose we are operating in the states of Illinois, Wisconsin and Indiana. We know the populations in these states. We know our sales in these states. What would you think of a sales result which showed that in Illinois we sold $400 per thousand of inhabitants and in Indiana we sold $40 per thousand of inhabitants? It is easy to determine these figures and most houses have them. It would appear that we should bring up our results in Indiana.

We have other estimating factors as a guide. Suppose you are in the railway supply business and suppose you know that a certain railroad is spending this year $12,000,000 for new equipment. Suppose you had similar figures for all the railroads. You might be able to determine a ratio in terms of new equipment, to determine how much you could expect to sell. In fact, a number of companies do just this thing. So with our past performance in sales before us, with an analysis of our territory and possibilities at hand, and using our best judgment regarding general business conditions, we may decide before the beginning of the new year quite accurately the amount of business we may expect to receive. Similarly we may go through the same procedure with the gross profit.

The Reason for a Budget.

The advantage of a budget system is that it offers a goal to shoot at. We adjust all the elements to attain that particular goal, and month by month we see how near we are coming to it. Suppose by May 1 our sales and gross profits should be running ten per cent low. Will we go right on spending as much as we had originally started out to spend? Of course we won't. We will take ten per cent off of expense and change the other factors so that the net returns are consistent with the net returns we started out to get.

So far I have spoken only of estimating our sales and gross profit. Before the close of the year we, of course, must estimate how much we are going to spend. Suppose we decide our expense may amount of $154,000. How are we going to spend it? The sales department can only have so much. Let us sit around the table and settle it. Suppose we say the sales department can have 40 per cent of it. That is a good, liberal allowance for the average sales department. On that basis then we can say definitely that the sales department is going to have $61,000 to spend next year. There are other departments, of course. There is warehousing, accounting, billing, etc. There is the financial department to be taken care of and then there are such items as rent, insurance, taxes and the like. So we can decide in advance just how much the city sales group will have to spend, how much traveling expenses can be, how much for catalog, for advertising, for warehousing, billing, rent, insurance, etc.

Don't Make Too Much of Statistics.

The results of a plan like this, I believe you will agree, are obvious. At the beginning of the year, when we start out in business, we have the several major heads of departments thinking seriously about what we are going to do next year. We all get into the frame of mind of realizing that we in the sales department cannot have more than our share in the amount to be spent. Similarly the warehouse men and the financial men must accommodate themselves to this problem. All of these amounts are dependent upon our getting a gross profit as per the estimate which we have made. It eliminates the old fashioned idea of the sales department which thinks the financial department is holding it down. The sales manager certainly has no incentive under such a system like this to say that the credit man is tight, because he is trying to get in his collections. The sales department realizes that the question of collections is just as important from his standpoint as the question of attaining the gross profit.

Now so much for statistics. My title is sales manager You would almost think from what I have been saying that statistics are my diet—morning, noon and night. I believe in

statistics. I believe that the heads of the house should make a thorough study of all the elements of their business, and see that they are properly related. I don't believe, however, in carrying the statistics idea too far with the man in the field. I believe that the important thing for the man in the field is to be red-blooded and up-and-coming and have confidence in the house and confidence in himself.

Help the Salesman Hold Up His Chin.

Personally, it has been my observation that where the man is worked in a statistical manner and the man must turn in report after report of every move he makes, the man feels that he is subjected to a grinding statistical process. I do not believe that makes a man hold his chin up. When our salesman in Peotone, Ill., gets up in the morning after a bad night's sleep on a bad bed and gets a poor breakfast and is about to go out and call on our customers in Peotone, I believe, if when he goes to the desk he finds a letter from the house saying, "Your calls in Peotone are not satisfactory. You are only selling 18 cents per 1,000 people in Peotone. You haven't secured business from this customer," etc., I believe the results are harmful. That is a negative analysis to the salesman. I do not believe that is the kind of analysis which is going to make the salesman hold his chin up, go out of that hotel smiling, go over to the customer enthusiastically and put our message across.

Another thing we want our salesmen to have is a liberal delegation of authority. Personally, I am a strong believer in a decentralized organization. The autocratic idea, the idea everything must be approved by one man sitting at a desk in Chicago, I don't believe in. I believe we develop the best type of man and secure the best results by delegating authority through the organization just as far as possible When, therefore, our salesman starts out in Peotone, and calls on the telephone company, and the telephone manager says, "We received a barrel of batteries from you and those batteries were shelf-worn and old and they did not measure up to amperage," I want the salesman to learn the facts in that particular case, and then on the ground decide for the company what is to be done. I don't want that salesman to say, "I will write the house and you will hear from them in the next two or three weeks." Our salesman, in the eyes of the telephone company in Peotone, is the house. He is the only personal contact that customer has with us. To that customer he is the Western Electric Company.

Let that salesman hold his chin up, let that salesman go out enthusiastically and confidently and let him allow that claim if it appears just, and we will stand back of the salesman every time. If the salesman does not show ordinary commercial judgment out in the field, of course he is not the type of salesman that is going to make a success for the house. But let me say for the salesmen, that in my experience there have not been more than one or two cases where the salesman's judgment in the field was not a mighty lot better than the clerical judgment of a group of people in Chicago looking at a stack of papers and trying to decide for him.

Mold Business to the Democratic Idea.

In business I believe in the democratic idea. I don't believe that the old idea of having a business highly centralized, having it such that every man must focus back to headquarters, that there should be no delegation of authority—I don't believe in it. I believe that we will get the best results in American business if all of us will mold business more nearly to the democratic idea. I believe that each of us should attack our business problems with that frame of mind. Let us take the position that we are men. Let us talk to every man in our organization on the basis that he is a man. Let us bring out in every man all that we possibly can. When business takes the stand that it should open up the channels of its various departments and the channels of its information in the widest possible manner to all of its personnel, and when we as men approach our business with the feeling that we should take hold of not only our own work, but all the elements of our business, I believe that is the sort of organization and that is the sort of principle which is going to keep American business in the lead.

DENVER ELECTRICAL CONCERN ENLARGES STORE SPACE

Recently the B. K. Sweeney Electrical Company, Denver, Colo., added to its floor space by securing the store next to its place of business and connecting it with the original store. One of the features of the store is that the entire interior can be seen from the sidewalk. While some merchandisers do not agree with this plan, it has the advantage of offering opportunity for making an attractive interior arrangement that impresses the public. Those passing the store are not only attracted by the electrical appliances displayed in the window, but also by those in the store.

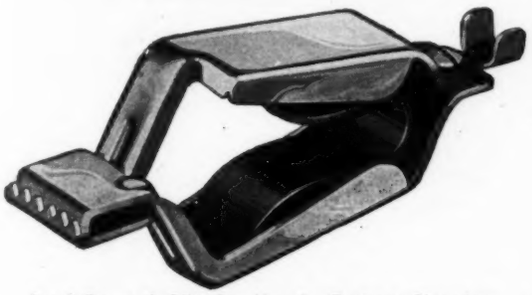
New and Novel Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Universal Test Clip for Use in Storage-Battery Charging.

The very extensive use of storage batteries for electric ignition, lighting and starting of automobiles is providing a very satisfactory business for garages, service stations and local electric shops. In order to charge such batteries conveniently, it is desirable to have some means at hand for connecting to their terminals readily without the need of elaborate connections between different sets of batteries. Since battery terminals are very commonly badly corroded, the making of a proper connection takes considerable time and care.

This problem is solved by means of a very simple and effective terminal clip known as the Universal test clip No. 21-A It is one of the series of test clips manufactured by P. S. Mueller & Company, 423 High Avenue, Cleveland, O.



Lead-Covered Clip for Use in Battery Charging.

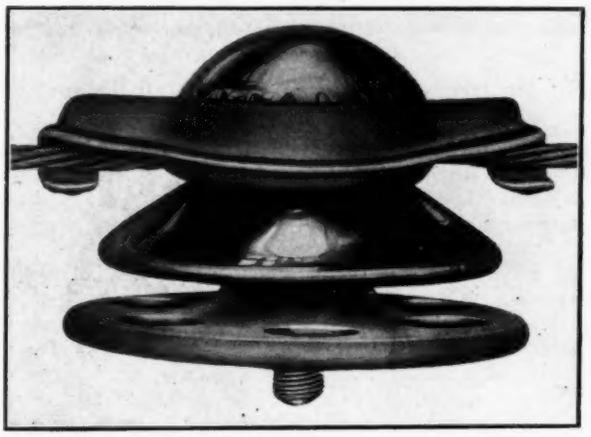
This new clip has been especially designed for the purpose referred to and is made of steel that has been thoroughly lead-plated so as to protect it from the action of battery acids. It has very strong jaws with contact teeth that will readily bite through a corroded battery terminal so as to secure satisfactory connection. A very valuable feature of this device is that a set of jumpers provided with these test clips can be used for very quickly connecting battery sets to a circuit. These clips have a jaw opening of 1½ inches and a carrying capacity of 35 amperes, thus making them suitable for charging practically all storage batteries for automobile service.

Trolley-Wire Suspension for High Direct-Current Voltage.

The higher direct-current voltages now coming into use for the operation of electric railways have necessitated new types of overhead line material.

As a result of these changed conditions, the General Electric Company, Schenectady, N. Y., has developed a special insulating suspension for trolley wires. It is designed to meet conditions where 1,200 volts and 1,500 volts are used and insulates the trolley wire from the cross span or bracket. This suspension has a porcelain body into which a specially designed stud capable of withstanding a strain up to three tons is cemented. A malleable-iron span yoke is provided for attaching to the span wire and a malleable-iron wheel guard affords protection against "wild" trolley poles.

In view of its construction of malleable iron, porcelain and cement, it may be used also for electric industrial railways in plants where the lines are subjected to excessively



Trolley Suspension for High-Tension Direct-Current Railways.

high temperatures without regard to the voltage; as in the case of smelting, coke, iron and steel plants.

New Portable Electric Tire Pump with Air-Storage Tank.

A complete, compact and handy outfit for the garageman and dealer is the new portable air tank and electric pump recently put on the market by Black & Decker, Baltimore, Md.

Portable Electric Tire-Pump Outfit.

A substantial air tank, fitted with a No. 2 "Lectroflater" air pump, is mounted on a strong cradle base, supported by two large wheels and one large swivel castor. The mechanism

operates on the same principle as the other Electroflater outfits previously described in these columns.

A comfortable pushing handle is attached to the compressor platform, and the outfit is very easy to steer and handle. It is fitted with rubber tires when desired for use on hardwood or tiled flooring. When emptied, the tank may be wheeled to the nearest electric connection for either direct or alternating current and left there to refill itself. An automatic switch cuts off the current when proper pressure is reached.

One of the advantages claimed by the manufacturers for this outfit is that its piping and vital parts are thoroughly protected against injury from bumping into cars and other objects, thus preventing leaky joints. The outfit is neatly finished in green and black enamel, nickel-trimmed. This outfit is also useful in steel mills, machine shops and other factories, for blowing dust out of motors, generators, etc.

Simple Means for Alining Flush Wall Receptacles.

When installing flush plug receptacles it has been the general practice to use the brass flush plate as a medium to bring the receptacle itself into alinement with the surrounding trim. If after attaching the flush plate it was found that the receptacle was out of line, it was then necessary to remove the plate and adjust the receptacle.

Despite long-standing objections to the roundabout method necessary to properly aline receptacles, nothing has been developed to secure the desired result easily until the recent introduction by Harvey Hubbell, Incorporated, of Bridgeport, Conn., of a receptacle of the Hubbell standard interchangeable type equipped with a special alining plate of novel design.

The use of this combination makes it possible to secure positive alinement before attaching the brass flush plate.

Elliptical slots in the alining plate, through which the

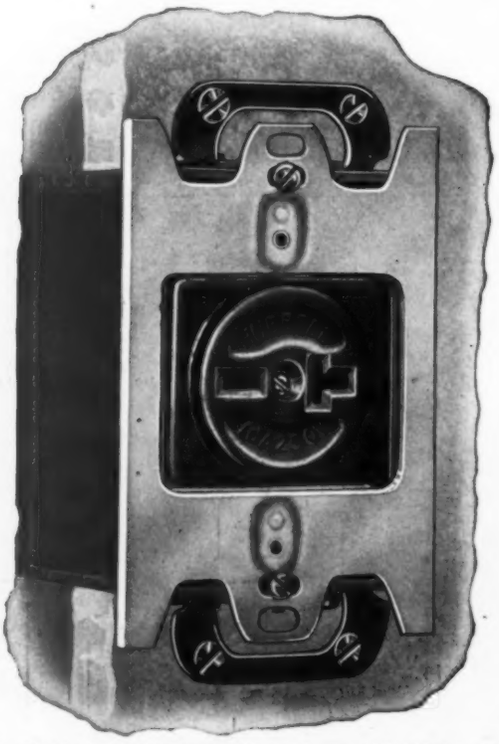


Fig. 1.—Hubbell Wall Receptacle with Special Alining Plate.

screws pass to the outlet box, allow free movement for alining and adjusting to wall variations. This plate overhangs the edges of the outlet box and fits flat against the wall, as illustrated in Fig. 1, giving greater security to the receptacle and increased rigidity to the struck-up flush plate, shown separately in Fig. 2.

An added feature, the value of which will be recognized by all contractors handling large building operations, is the

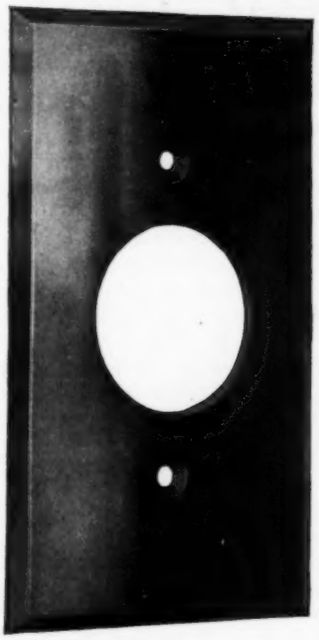


Fig. 2.—Face Plate for Flush Receptacle.

protection from dust and dirt this alining plate affords the outlet box and receptacle plate while the building is under construction.

Headstock Motor-Drive and Control Equipments for Woodworking Lathes.

The tendency of progressive shop managements is to eliminate as far as possible belt-driven machines, in which are always lurking the possibilities of accident. This is especially advisable in the manual-training shops of schools and colleges, where the machines are operated by students of immature age and practically no experience in this line of work—boys and girls whose sense of responsibility is not likely to be very highly developed, and to whom the possibility of danger usually gives little concern.

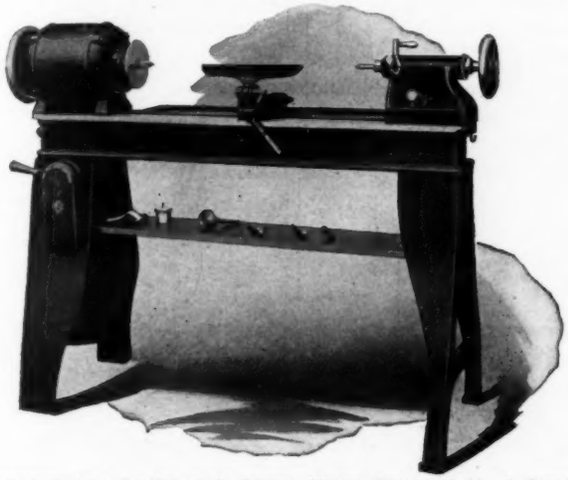
To provide a perfectly safe method of drive for these and other shops where small woodworking lathes are used, and at the same time to furnish an equipment combining the most modern ideas of shop practice with the best engineering thought, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is now marketing a line of headstock motor equipments. The motors take the place of the cone pulleys and belts required on belt-driven woodworking lathes. The face plates are mounted directly on the motor shaft. Different speeds are obtained by adjusting the speed of the motor by means of a controller mounted on the lathe.

By this method of drive the quality of the work and the production is greatly increased as the operator is enabled to use exactly the right speed for the particular piece of work in hand. The tool being under perfect control, there is no fluctuating change in cutting speed due to belt slippage, such as is the case with belt-driven lathes. No valuable time is wasted in changing belts and adjusting machines to obtain various speeds. A small movement of a conveniently situated controller handle gives the proper speed for any depth of cut, or for any diameter of stock up to the capacity of the lathe. Elimination of belts insures added safety for the workmen and a better lighted and more sanitary shop. There is no delicate mechanism requiring frequent attention. Occa-

sional inspection and lubrication will keep the apparatus in good condition almost indefinitely. Construction and design are such that successful operation is assured even with hard usage and unskilled handling.

Each equipment consists of a motor and a controller especially designed for this service. The operating circuit may be either alternating current or direct current, the apparatus differing to conform to the characteristics of the circuit.

For alternating-current circuits a special four-speed, ball-bearing motor is furnished, for mounting on the top of the lathe. The design of the motor frame permits removal of either end bracket. Solid end brackets make the motor totally inclosed, excluding all dust and foreign substance. The feet are cast integral with the brackets giving maximum rigidity



Woodworking Lathe with Direct Motor Drive of Head Stock and Controller in Left Leg of Lathe.

to the motor. The ball bearings take end thrust in either direction.

The end of the motor shaft nearest the tail stock is provided with an internal taper suitable for holding a live center. A male thread is also provided on this end to take a face plate. The shaft extension on the opposite end of the motor is threaded to take a handwheel in the rear face plate.

Motor speeds of approximately 570, 1140 and 3450 revolutions per minute at full load, are given by the four running points on the controller. The controller is mounted in the leg of the lathe and is operated by a handle furnished by the lathe builder, which projects through an opening in the leg. Dynamic-braking effect for slow-down is obtained by throwing on the next lower speed. The motor should be brought to the lowest speed before being finally stopped by the handwheel.

For direct-current circuits an adjustable-speed, commutating-pole, shunt-wound motor is furnished, giving speeds by field control over a range of from 600 to 3000 revolutions per minute. It is mounted in the same manner as the alternating-current motor and resembles it in general construction.

The controller for the direct-current equipments is very simple in construction and is designed to be operated successfully by the most inexperienced operator. It is mounted in one leg of the lathe and is completely inclosed by a cover plate. The main-line switch handle and the speed-adjustment handle are located in depressions in the cover, which provide plenty of room for easy manipulation, at the same time protecting the handles from injury, from falling articles, or from catching the operator's clothing. In starting the motor, the line switch must be turned to "on" but a simple mechanical device makes it also necessary to have the speed-adjustment handle in the first or low-speed position.

Protection against low voltage and overloads is afforded by relays, which open the line circuit and stop the motor. The operator may stop his machine at any time by using the main-line switch to open the circuit. Dynamic braking automatically brings the motor to a quick stop in all cases as soon as the line circuit is opened. No matter how the motor may be stopped, it can only be started with the controller handle on the first or low-speed position. Thus perfect protection is provided against injury to the motor through careless handling of the controller.

Arrow Push-Through Socket.

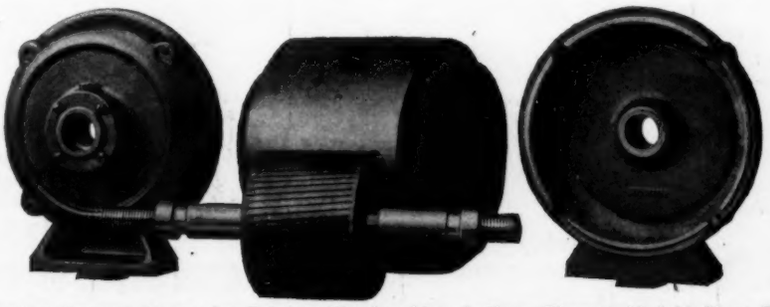
The push-through socket manufactured by the Arrow Electric Company, Hartford, Conn., has the quick-make-and-break switch mechanism and the rating of 660 watts 250 volts, which is usual with that type of socket.

It has also the advantage of being a part of the "Arrow-E Little-20" socket line and therefore interchangeable with 14 different body parts and 15 different caps.

New Arrow Push-through Socket.

Beside the convenience of the "Little-20" snap-shell connection, this socket has the threaded bead for Uno shade-holders, and can be equipped with the Arrolock attachment to prevent the removal or theft of lamps.

Sockets of this type are rapidly coming into favor both with contractors and users.



Alternating-Current Motor for Driving Woodworking Lathes—Disassembled to Show Parts.

Simple and Effective System for Estimating Industrial Illumination

The Hubbell System for Readily Determining the Proper Type and Size of Reflectors

The subject of industrial illumination covers a broad and comprehensive field of electrical practice. It includes not only the phase of proper and adequate lighting, but factors of economic utilization which make for the best and most effective installations under various conditions of shop and factory arrangement.

Reflectors for the diffusion of light are an important consideration of illumination in manufacturing and industrial establishments, with the necessity for the selection of the right type of reflector to bring about the correct lighting installation in the plant, a matter of particular importance. The installation of necessary and adequate lighting facilities, from all primary points of accomplishment, ordinarily requires careful and intelligent calculation, both technical and otherwise, for complete fulfilment of purpose, and coupled with this compilation of data, the specifying of the desired and essential type of reflector demands careful and considerate attention.

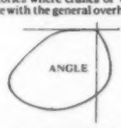
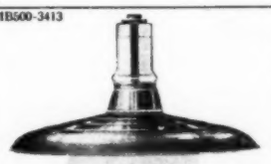
Harvey Hubbell, Incorporated, of Bridgeport, Conn., in connection with its well known types of reflectors, has been engaged during the past few years in extensive development work in this line, and the results of this research have brought about some interesting and effective accomplishments for the benefit of those engaged in the lighting field.

One of the most important considerations in industrial illumination is to make more and better use of the light available, rather than to provide a particularly brilliant light, and this has been one of the basic principles upon which this development work has been carried out. Considering reflector installation, the distribution of light is not solely dependent upon the size and shape of the attachment, as two reflectors of entirely different form and dimensions may give almost identical light distribution.

On the other hand, the inside finish of the reflector has a particular bearing upon the light distribution—even more so than the exact character or size of reflector. In this, as is generally known, a small reflector with aluminum inside finish is capable of diffusing light over an area equal to that attained by a larger or differently shaped type with white enamel reflecting surface, making possible practically like results under average conditions.

An interesting and comprehensive system has been devised for the selection of proper lamps and reflectors for localized and general illumination in industrial service with the use of the various types of Hubbell reflectors, holders, and sockets, and linking up the lamp capacity with a definite distribution of light. It covers with careful detail correct reflector installations for different classes of service, as well as other essential considerations in connection with lamps of various capacities and types.

REFLECTORS—SCHEDULE C

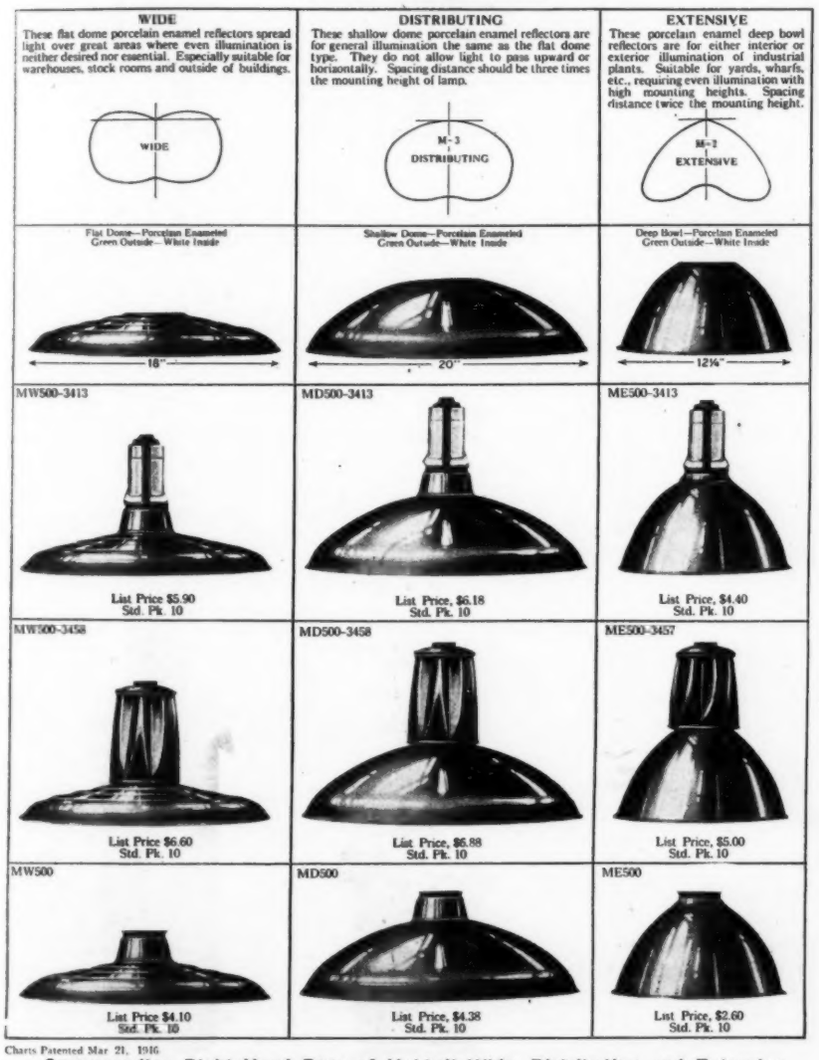
REFLECTORS FOR 500 WATT TYPE "C" LAMPS		ANGLE These porcelain enameled angle reflectors distribute light as shown. Spacing distance is 1¼ times the distance the lamp hangs from the surface to be illuminated. Recommended for bill-boards, building fronts and as side wall units in factories where cranes or other apparatus interfere with the general overhead lighting.	DIFFUSING These reflectors are recommended for general illumination. When fitted with opal globes they spread a soft diffused light. May be used in addition to local lights.
			
		Angle—Porcelain Enameled Green Outside—White Inside 	Flat Dome with 8" Holder—Porcelain Enameled Green Outside—White Inside
No. 3413 Hubbell Mogul Porcelain Socket with strap holder For ½" pipe.		MN500-3413 List Price, $6.18 Std. Pk. 10	MB500-3413  List Price, $6.32 Std. Pk. 10
Nos. 3457 and 3458—Hubbell Mogul Porcelain Sockets with strap holder and Japanned ventilated corrugated cover For ½" pipe.		MN500-3458 List Price, $6.88 Std. Pk. 10	MB500-3458 List Price, $7.02 Std. Pk. 10
L—Extension. Will fit any standard 3¼" Holder		MN500 List Price, $4.38 Std. Pk. 10	MB500 List Price, $4.52 Std. Pk. 10

Typical Left-Hand Catalog Page of Hubbell Angle and Diffusing Reflectors for 500-Watt Mazda Lamps.

The system is as novel as it is simple, encompassing the accomplishments of the development work in concrete form for ready reference and guide for the illuminating engineer, the lamp man, and the user, being designed with the view of utmost utility and value to these and allied interests in the

lighting field. It eliminates the necessity for any extended calculations in illuminating work of individual nature, or in fact practically all calculations of any importance as regards the distributing area, lamps and reflector types, taking, of course, the fundamental installation requirements as the basis for computation. This system, fully set forth in the new Hubbell catalog which is just being issued, employs the use of patented charts and double pages in the section devoted to this subject, as shown in the accompanying illustrations.

With regard to the established standards as adopted, it is explained that the reflectors have been designed to include four fundamental distributions as follows: (1) distributing; (2) extensive; (3) intensive; (4) focusing. In other words, the types have been designed both for new and present lighting systems, and with the view of correcting any existing faults as may be evidenced in the latter. The reflectors have been perfected in shape and finish to distribute light from extended areas to concentrated units in a brilliant beam, or to afford any intermediate distribution as might be desired.


REFLECTORS—SCHEDULE C
WIDE
These flat dome porcelain enamel reflectors spread light over great areas where even illumination is neither desired nor essential. Especially suitable for warehouses, stock rooms and outside of buildings.
DISTRIBUTING
These shallow dome porcelain enamel reflectors are for general illumination the same as the flat dome type. They do not allow light to pass upward or horizontally. Spacing distance should be three times the mounting height of lamp.
EXTENSIVE
These porcelain enamel deep bowl reflectors are for either interior or exterior illumination of industrial plants. Suitable for yards, wharfs, etc., requiring even illumination with high mounting heights. Spacing distance twice the mounting height.
WIDE
M-3
DISTRIBUTING
M-2
EXTENSIVE
Flat Dome—Porcelain Enameled Green Outside—White Inside
Shallow Dome—Porcelain Enameled Green Outside—White Inside
Deep Bowl—Porcelain Enameled Green Outside—White Inside
18"
20"
12¼"
MW500-3413
MD500-3413
ME500-3413
List Price $5.90 Std. Pk. 10
List Price, $6.18 Std. Pk. 10
List Price, $4.40 Std. Pk. 10
MW500-3458
MD500-3458
ME500-3457
List Price $6.60 Std. Pk. 10
List Price, $6.88 Std. Pk. 10
List Price, $5.00 Std. Pk. 10
MW500
MD500
ME500
List Price $4.10 Std. Pk. 10
List Price, $4.38 Std. Pk. 10
List Price, $2.60 Std. Pk. 10
Charts Patented Mar 21, 1916

Corresponding Right-Hand Page of Hubbell Wide, Distributing and Extensive Reflectors for 500-Watt Mazda C Lamps.

The four classifications of light distribution mentioned include the following considerations:

(1) *Distributing.*—This embraces the distribution of light for general illumination. The light is reflected downward over a particular area at a low intensity, and does not pass upward or in a horizontal direction. Installations of this character are for use primarily in large factory rooms, warehouses, or other industrial plants where a well distributed volume of light is desired and not any particular concentrated intensity. It is recommended that reflectors giving this distribution should be spaced three times the mounting height for general illumination.

(2) *Extensive.*—Under this classification is included the distribution of illumination of high and uniform intensity, specifically relating to even and uniform lighting. The reflectors are sufficiently deep to shield the eyes from direct glare, providing a maximum intensity of light rays at an angle of approximately 45 degrees. To render the most effective illumination, reflectors for this style of distribution should be spaced at a distance approximately equal to twice the mounting height above the lighted plane.

(3) *Intensive.*—This type of illumination is for group purposes, such as would be utilized for machine and lathe work and kindred features of industrial activities. A deep bowl reflector is used delivering a highly intensified light, at the same time cutting off the glare from the line of vision. For uniform illumination these reflectors should be spaced at a distance of about one and one-quarter times the mounting height. Where lamps are placed unusually high, this type of lighting is more satisfactory than the "extensive."

(4) *Focusing.*—Distribution of this nature is necessary where high intensity over a small area is desired. The smaller units of this type may be used effectively for concentrating light over individual operations as bench or lathe work, vise work, and the like, while the larger units mounted pendent or on brackets give excellent service for inspection tables and other operations requiring the close application of light. The spacing for reflectors for this style of lighting, to provide uniform illumination should be three-quarters times the mounting height.

In presenting this system for figuring illumination in its catalog, the company has devoted a double page for respective lamps of the various wattages, ranging from 10 to 1,000 watts in the multiple type, with reflectors, holders, and sockets corresponding to the particular size of lamp. The basis of calculation in connection with the reflectors might roughly but readily be interpreted as a formula as follows: $L \times D = R$, where L is the light, D the distance, and R the reflector required.

Referring to the accompanying illustrations, which represent a typical double page from the new catalog, it will be seen that the different characters of distribution explained above are incorporated, as well as that of angle diffusion. In the latter the reflectors usually hang at an angle of about 30 degrees with spacing one and one-quarter times the distance the lamp is hung over the surface to be illuminated. This type of illumination with smaller lamps is designed par-

ticularly for lathe and machine work, to afford suitable eye protection, and with lamps of 300 to 500-watt size for billboard illumination, building fronts, and the like. The "wide" distribution employs flat-dome porcelain enamel reflectors which diffuse the light over extensive areas where even distribution is not particularly essential. The "distributing" classification includes the shallow-dome porcelain reflectors which are designed for general lighting, and with spacing about three times the mounting height of the lamp.

Under these headings are shown the respective Hubbell reflectors of porcelain enameled types with proper holders and sockets. In the diagrams denoting the character of illumination, the symbols are given as M-3, M-2, etc., indicating at a glance the correct mounting height or spacing of the lamp, as above mentioned.

The exceptional utility of this system for the illuminating engineer, the lamp man and user is practically self-explanatory. The following example will readily show the advantage for immediate service:

Assume, for instance, that it is desired to use a 500-watt lamp for a distributing area with a porcelain socket of the Hubbell mogul type. Noting this classification at the head of the particular column and the style socket preferred under the lamp specification, the reflector shown in the intersecting square of the vertical and horizontal columns, reading down and across, respectively, is the necessary type, in this case known as MD500-3413. From this latter it will be apparent that the stock number, the list price, and standard package quantity are given for immediate reference, as well as the size and character of lamp (noted by MD500). Again, it is at once understood from the indication M-3 in the diagram at the head of the column that the spacing distance should be three times the mounting height.

Considering smaller lamps, as the 10 to 100-watt types, the system is even more comprehensive, including as it does both porcelain-enameled and paint-enameled reflectors for this type of lighting, and including a wide range of Hubbell holders and sockets.

The value of this system and the facility with which it can be employed by those engaged in the lighting field will be readily seen. One does not have to be a technical man to arrange a proper reflector installation under desired conditions, and careful consideration to the specified units with different character of illuminating areas will effect positive and assured results in service, without possibility of error or inaccuracy in computations. At the same time by consulting the Hubbell system one is afforded an immediate guide to the proper spacing of the lighting units under different conditions of operation, as well as provided with an exceptionally broad range of many different combinations of reflectors, holders, and sockets to cover practically all phases of installation for individual lighting service.

Westinghouse Outdoor Current Transformers.

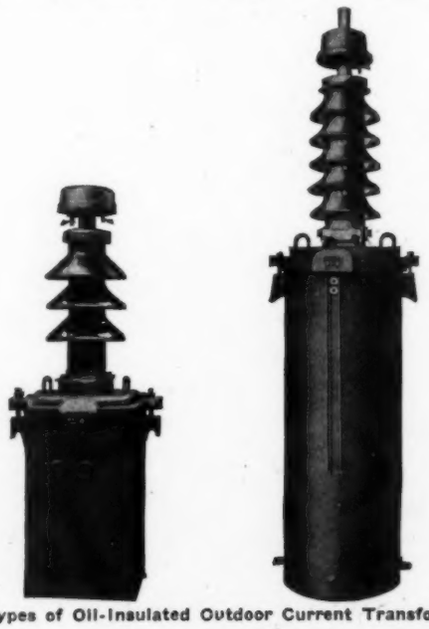
Current transformers are employed for one or both of two purposes; to reduce the current to be measured to the relatively small values suitable for measuring instruments, relays, circuit-breakers, and trip coils, or to insulate meter circuits from high line voltage. To meet the growing demand for such apparatus as a part of outdoor substation equipment, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed and is marketing a complete line of outdoor current transformers for voltages up to and including 70,000 volts.

These outdoor current transformers are of two general types—dry and oil-insulated. The dry-type transformers are for use on circuits up to 24,000 volts. For circuits of higher voltages the oil-insulated transformer is used. Both types are designed for use on from 25 to 133-cycle alternating-current circuits and have a capacity rating of 50 volt-amperes. They are compensated for 25 volt-amperes. The dry-type transformers are furnished in three styles and designated by type letters. Type MA is for voltages up to 8,000, type MB for voltages to 17,000, and type MC for up to 24,000 volts. The oil-insulated transformers are also furnished in three types; type OA for maximum voltages of 35,000; type OB for voltages of 47,000, and type OC for up to 70,000 volts. The primary amperage of the dry-type transformers varies from 5 to 500 amperes, that of the oil-insulated transformers from

Two Types of Dry-Core Outdoor Current Transformers.

5 or 10 to 200 or 400 amperes. All give a secondary amperage of 5.

The dry-type transformers are mounted in cast-iron end caps with the leads extending downward through suitable bushings and are impregnated with an insulating compound which thoroughly seals up the joints between the laminations and the end caps. Wrought-iron hangers are pro-



Two Types of Oil-Insulated Outdoor Current Transformers.

vided, bent to engage standard crossarms and punched to fit the holes in the back of the arms with lag screws. The transformers are constructed of the best grade of materials. All coils are vacuum-treated and impregnated with an insulating compound, giving a high factor of safety. A high degree of accuracy of transforming ratio is maintained over the entire range of the transformers.

Activities in the Trade

Western Electric Company, Incorporated, has filed notice at Trenton, N. J., of increase in its capital from $15,750,000 to $30,750,000.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued a calendar which carries illustrations of a number of institutions using Cooper Hewitt lamps.

The Electric Storage Battery Company, Philadelphia, Pa., has awarded a contract for the erection of a one-story addition to its plant, to cost $10,000.

Pass & Seymour, Incorporated, Syracuse, N. Y., are having plans prepared for a three-story, reinforced-concrete addition to the manufacturing plant.

General Lead Batteries Company, Newark, N. J., has issued bulletin No. 21, descriptive of and listing its "Titan" batteries for starting and lighting of automobiles.

The Okonite Company, manufacturer of insulated wire and cable, removed its general offices on April 23 to new quarters in the Astor Trust Building, 501 Fifth Avenue, New York City.

The Ironton Incandescent Light & Supply Company, of Ironton, O., has increased its capital stock from $25,000 to $100,000 for the purpose of making plant extensions and improvements.

A. Eugene Michel and Staff, advertising engineers, have announced their removal from the Woolworth Building to larger quarters in the Morton Building, 116 Nassau Street, New York City.

H. Boker & Company, 101 Duane Street, New York City, have issued a circular on electric fans, covering their principal 1917 models. Copies of the circular will be sent to the trade upon request.

Jent Electric Company, manufacturer of tungsten lamps, has acquired property at 369-71 Ogden Street, Newark, N. J., for a new plant. It is said that about 500 men will be employed for full operation.

Hart Manufacturing Company, Hartford, Conn., has issued a folder on its line of automobile accessories, which include push-button lighting switches, tonneau lamps, and foot and hand push-button control switches.

Hughes Electric Heating Company, 5650 West Taylor Street, Chicago, Ill., has issued a folder announcement to the trade regarding the inauguration of its national advertising campaign on Hughes electric ranges.

The Electro-Dynamic Company, Bayonne, N. J., will build a three-story addition to its dynamo and motor manufacturing plant to cost $15,000. The company is a subsidiary of the Electric Launch Company.

Crouse-Hinds Company, Syracuse, N. Y., is sending out a folder descriptive of its Imperial flood-light projectors, emphasizing their application at the present time for the protection at night of public buildings, industrial works, etc.

P. & B. Manufacturing Company, Milwaukee, Wis., manufacturer of electrical devices, has taken out a permit for the erection of a $14,000 factory building at Becker and Fratney Streets. The company's plant was recently destroyed by fire.

A. D. Granger Company has announced the removal of its offices to the Park Row Building, 15 Park Row, New York City. The company handles complete lines of power-plant and other equipment, and makes steam and electric plant installations.

The Western Coil & Electric Company has been incorporated at Racine, Wis., with a capital of $30,000. The incorporators are James V. Rohan, William Mitchell and James W. Gilson. The company will manufacture a number of electrically operated machines and devices.

National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill., has prepared an attractive 48-page booklet entitled "How to Know and Have Good Lighting." The text gives many points regarding good lighting practice and the illustrations serve to show examples of illuminating engineering done by the company in residences, offices, hotels, schools, libraries and other institutions.

Smith & Hemenway Company, Incorporated, manufacturer of the well known "Red Devil" tools, 99 Chambers street, New York City, has removed its executive offices from that address to 130 Colt street, Irvington, N. J., where the company's factory is located. The consolidation of office and factory facilities was made to place the company in a still more advantageous position for serving the trade. A sales office for handling New York City and export trade will be maintained at 261 Broadway, New York City.

The Holland Lighting & Specialty Company has been incorporated at Holland, Mich., with a capital of $35,000 to manufacture and install the "Holland" home-lighting systems invented and developed by Henry Kraker, of Holland. Thomas Olinger is president and general manager of the new firm; H. J. Boone is vice-president and field sales manager, and Henry Kraker is secretary. These, with A. H. Landweler and J. P. Kolla, constitute the board of directors. The company will occupy the factory formerly used by the Holland Wire Fence Company, and will start the manufacture of equipment in the very near future.

The Electric Storage Battery Company, Philadelphia, Pa., has issued catalog KXS, describing its latest type of portable battery for railway signal service. This battery has been especially designed to give 60-day service on one charge, with very little increase in weight, as compared with types heretofore used for 30-day service. Particular attention has been given to details of design making for durability and long life. The plates, separators, jars, covers and carrying cases are of especially rugged construction. A double-flange cover and automatic filling and vent plug are important features, eliminating the escape of acid spray during charge and preventing slopping of acid over the tops of the cells while filling. The many important improvements embodied in these batteries should strongly appeal to the railway signal engineer.

Organize Automotive Electric Association.—An organization of manufacturers of automotive electric accessories was formed at Atlantic City, N. J., April 16. The new organization will be known as the Automotive Electric Association, and among its members are the largest and best known manufacturers in this line. The purposes of the organization are to improve and develop this branch of business through standardization and by friendly interchange of experience with reference to design and manufacture. The following officers were elected at this meeting: G. Brewer Griffin, president, Pittsburgh, Pa.; C. O. Mininger, vice-president, Toledo, O.; G. S. Cole, secretary, Cleveland, O.; C. L. Amos, treasurer, Syracuse, N. Y. The next meeting of the association will be held at Hot Springs, Va., May 17-19.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electric Code as recommended by the National Fire Protection Association

CONDUIT BOXES.—Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

For use with flexible tubing, catalog Nos. 227, 230, 237, 240, 253, 260-3, 270-3, 276.

Extension rings for concrete work, catalog Nos. 103-X, 1030-X, 105-X, 1050-X, 202-6.

For use with flexible tubing and steel conduit, catalog Nos. 225, 228, 235, 238, 245, 247, 248, 250, 251, 274, 275.

Also above types with steel or brass covers, including porcelain bushings, or covers with smooth, well-rounded outlet holes for flexible cords.

Listed March 16, 1917.

FIXTURES.—Hamilton Manufacturing Company, Two Rivers, Wis.

Electric fixtures made up with standard rigid conduit or metal molding and standard fittings, for use in connection with typesetters' cabinets in printing establishments.

Listed March 21, 1917.

HEATERS, Air.—Estate Stove Company, Hamilton, O.

"Estate" non-luminous, 660-2,000 watts, 110 volts, catalog Nos. 85-87.

Listed March 30, 1917.

HEATERS, Cooking Appliances.—Estate Stove Company, Hamilton, O.

Cooker, 500 watts, 110 volts, catalog No. 93.

Hot plates, 2,500 watts or less, 110 volts, catalog Nos. 1001-03.

Oven, 2,400 watts, 110 volts, catalog No. 91.

Ranges, 8,150 watts or less, 110-220 volts, catalog Nos. 82, 84, 88.

Listed March 30, 1917.

INSULATING MATERIALS—General Electric Company, Schenectady, N. Y.

Moldable insulating material having the following poperties; practically non-absorptive; slightly brittle; not strictly non-combustible; good dielectric strength; slightly softened by temperature of 212 degrees Fahrenheit; good mechanical strength; not affected by oils; easily worked with tools. "No. 55."

This material is judged to be suitable for parts of electrical devices requiring these properties. Manufacturers of such devices desiring to use this material should submit samples in commercial form for examination and test by Underwriters' Laboratories.

Listed March 20, 1917.

INSULATING-DEVICE SEALING COMPOUNDS.—General Electric Company, Schenectady, N. Y.

Sealing compound having a melting point in excess of 200 degrees Fahrenheit for sealing screw heads, nuts, bolts and other live metal parts of electrical fittings where such sealing is required by rules of National Electrical Code. "No. 233."

Listed March 20, 1917.

MISCELLANEOUS, Automatic Wrapper Sealing Machine.—Johnson Automatic Sealer Company, Limited, Battle Creek, Mich.

Machine for automatically wrapping packages in waxed papers and sealing the wrappers by contact with electrically-heated metal surfaces. The equipment includes a rheostat and switches for control of heater circuits, and motor for individual drive when ordered. "Johnson Waxtite." Motor rating: 1 horsepower, 220 volts or less, alternating or direct current. Heater circuits: 900 watts or less, 220 volts or less.

Listed April 13, 1917.

OUTLET PLATES.—Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

Extension Ring for Conduit Box in Concrete Construction.—Chicago Fuse Manufacturing Company.

Steel outlet plates. "Union." Catalog Nos. 212, 215, 220, 222.

Listed March 16, 1917.

RECEPTACLES, Medium Base.—Electric Changeable Signs & Illuminating Company, 213 Fifty-eighth Street, Brooklyn, N. Y.

"Electric Changeable," porcelain shell, keyless, 250 watts, 250 volts, for temporary lighting only and only when connected to No. 12 or No. 14 B. & S. gauge stranded rubber-covered wire.

Listed March 20, 1917.

RECEPTACLES (For Attachment Plugs) AND PLUGS.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" Spartan, 10 amperes, 250 volts, catalog Nos. 111, 113, 120, 122; cap, KE.

Listed March 19, 1917.

SIGNALING SYSTEMS—National Scale Company, Chicopee Falls, Mass.

Call system consisting of single-stroke bells, relay and sending station, all operating at 125 volts. Signals are transmitted to bells from sending station by relay magnets. Bells to be wired in multiple.

Listed April 13, 1917.

SOCKETS, Medium Base.—Pass & Seymour, Solvay, N. Y.

"P. & S." metal shell.

Key, catalog Nos. 7546, 7548, 7550, 7552; electrolier, catalog Nos. 7000, 7002, 7004, 7010, 7014, 7017, 7021, 7024, 7027, 7030.

Keyless, electrolier, catalog Nos. 7001, 7003, 7005, 7100, 7101-2, 7104-7.

Pull, electrolier, catalog Nos. 7006-8, 7012, 7016, 7019, 7023, 7029, 7032.

Listed March 26, 1917.

SNAP SWITCHES AND FUSES, Combination.—Bryant Electric Company, Bridgeport, Conn.

Double-pole snap switches combined with plug-type fuse bases. "Bryant" or "Perkins" 10 amperes, 125 volts, catalog Nos. 2698-2700.

Listed March 19, 1917.

SWITCH BOXES—Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

Sheet-steel, single and gang type boxes for mounting switches and attachment-plug receptacles. "Union."

Flexible conduit or tubing pattern, catalog Nos. SF, SS, SR.

Flexible conduit pattern, catalog No. Gem Y.

Flexible or rigid conduit pattern, catalog Nos. Gem BD, 170-A, 302-309, 322-330, DS-1-6.

Listed March 22, 1917.

SWITCHES, Clock-Operated Automatic.—Electric Flasher Company, 80 Fifth Avenue, New York, N. Y.

Automatic switch consisting of clock mechanism, connecting gear and standard, labeled snap switch, all inclosed in metal case and designed to open and close circuit at predetermined periods. "Universal," 5, 10, 20 and 30 amperes, 250 volts.

Listed March 30, 1917.

WIRE CONNECTORS.—Walger Connector Company, Toronto, Canada.

Wire connector, consisting of a metal terminal plate with binding screws inclosed in a molded insulating composition sleeve having a threaded cap of the same material. "Walger."

For use with wire no larger than No. 14 B. & S. gauge and only for connecting fixture wires to supply circuits at fixture outlets, and where open to view for connecting motor leads to supply circuits.

Listed April 13, 1917.

Personal and Biographical

MR. RUSSELL H. BALLARD, as president of the newly formed Pacific Coast Section of the National Electric Light Association, was accorded signal honor by the unexpectedly large attendance at the first annual convention of this Section, held at Riverside, Cal., April 19 and 20. Under Mr. Ballard's administration the Section, comprising 51 electric light and power companies was organized, representing an invested capital of approximately $500,000,000. The attendance at the convention of over 500 delegates was in a large measure a personal tribute to the leadership

R. H. Ballard.

of the president. Mr. Ballard is secretary and assistant general manager of the Southern California Edison Company, Los Angeles, Cal., and for the past two years has been vice-president of the National Electric Light Association. Mr. Ballard was born at Hamilton, Ontario, in 1875 and began his business career at the age of 15 with the Thomson-Houston Electric Company at Chicago, meanwhile studying at night. When his firm was absorbed by the General Electric Company in 1894, Mr. Ballard was transferred to the latter's treasury department at Schenectady, N. Y. Going to Los Angeles from the General Electric Company, Mr. Ballard entered the employ of the Westside Lighting Company, the predecessor of the Edison Electric Company of Los Angeles. In 1900 he became cashier and office manager of the Butte Electric & Power Company, of Butte, Mont., where he remained until 1904. He then returned to Los Angeles as auditor of the Edison Electric Company and entered upon a career which has demonstrated remarkable ability for organization, untiring energy and a diligence which has just been exemplified by his administration during the formation of the Pacific Coast Section.

MR. LUDWIG KEMPER, general manager and secretary-treasurer of the Minnesota Gas & Electric Company, Albert Lea, Minn., since 1905, has resigned to accept the position of engineer with the Field-Richards Company, Cincinnati, O., and will have general engineering supervision over the various public-utility and other properties in which that firm is interested. During his stay in Minnesota Mr. Kemper was very active in electrical circles, especially in the Minnesota Electrical Association of which he was secretary in 1900 and president in 1911 and 1916. He is succeeded at Albert Lea by MR. F. A. OTTO, formerly superintendent of the electrical department of the St. Paul (Minn.) Gas Light Company.

MR. J. C. DONALD has been appointed manager of the Ashland (Wis.) Light, Power & Street Railway Company, succeeding MR. A. E. APPLEYARD, who has severed his connection with the company.

MR. FRANK DIX has been appointed secretary-manager of the municipal electric lighting plant in Fort Wayne, Ind., during the absence of MR. JOHN WESSEL, who has enlisted in the United States Army.

MR. STANLEY P. FARWELL has resigned as chief of the service division of the engineering department, Illinois Public Utilities Commission. MR. D. C. WOOD, formerly assistant engineer, has been appointed acting chief in charge of the division.

MR. GEORGE B. QUIMBY, for many years associated with the Frank Ridlon Company, electrical manufacturer and contractor, 158 Summer Street, Boston, Mass., has become president of the Blake Electric Manufacturing Company, also of Boston.

MR. J. J. FLYNN has become associated with the department of publicity of the Society for Electrical Development, New York City. He was formerly connected with the typographical department of Conde Nast and other important advertising agencies.

PROF. C. R. RICHARDS, head of mechanical Engineering Department since 1911, has been appointed dean of the College of Engineering and director of the Engineering Experiment Station of the University of Illinois, to succeed DR. W. F. M. GOSS, who has resigned to become president of the Railway Car Manufacturer's Association of New York. Dean Richards is a graduate of Purdue University, class of 1890, and has been successively instructor in mechanical engineering, Colorado Agricultural College; and professor of practical mechanics, professor of mechanical engineering, and dean of the College of Engineering, University of Nebraska. Since entering the University of Illinois he served for two years as acting dean of the College of Engineering during an absence of Dean Goss. Dean Richards is a member of the American Society of Mechanical Engineers, Western Society of Engineers, Society for the Promotion of Engineering Education, Sigma Xi, Tau Beta Pi, Sigma Chi and Sigma Tau and other organizations.

MR. NORMAN B. HICKOX has recently been appointed advertising manager of the National X-Ray Reflector Company, with headquarters in the company's main office in Chicago. In addition to this new duty in the publicity department, Mr. Hickox remains as special personal representative of Augustus D. Curtis, president of the company, in sales promotion work throughout the West. Mr. Hickox is very well and favorably known in electrical circles and has a large quota of friends in the trade. He is an enthusiastic Jovian and was recently appointed Statesman-at-Large by Jupiter Henry

N. B. Hickox.

L. Doherty. Mr. Hickox is a member of the Chicago Electric Club-Jovian League, the National Electric Light Association, and the Illuminating Engineering Society.

MR. JOHN P. PULLIAM, of Oshkosh, Wis., manager of the Wisconsin Electric Railway Company for ten years, has become connected with the Clement C. Smith interests, which control the Wisconsin Railway, Light & Power Company of La Crosse, and other utilities. Mr. Pulliam will have offices in Milwaukee.

OBITUARY.

MR. WILLIAM BERRI, a member of the board of directors of the Edison Electric Illuminating Company of Brooklyn, N. Y., died in that city April 19. Mr. Berri was born in Brooklyn in 1848 and became one of its most influential citizens, devoting his interests to the carpet and furniture business, and to several publications in that field. He was also interested in the Kings County Electric Light & Power Company.

DESBLER BROWN, the baby son of Mr. and Mrs. Charles Edward Brown, died on the morning of Tuesday, April 24, at the Brown home, "Desbro House," Green Bay Road, Lake Forest, Ill. Mr. Brown is vice-president of the Central Electric Company, Chicago, Ill.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

AUGUSTA, ME.—The Franklin Power Company has been incorporated with a capital stock of $300,000, to supply electricity and gas in Farmington and surrounding towns. The charter gives it power to develop water powers and erect plants. The officers are: F. J. Savage, Fairfield, president; A. S. Gilman, Oakland, clerk; C. O. Sturtevant, Farmington, treasurer.

PORTLAND, ME.—Plans are being completed for two extra penstocks at the big dam of the Cumberland County Power & Light Company at the Great Falls of the Saco at Hiram. The dam as originally planned is complete, and the powerhouse is being constructed. Two more penstocks would increase the capacity of the plant 75 per cent.

PITTSFORD, VT.—The Pittsford Power Company, a subsidiary of the Rutland Railway, Light & Power Company, Rutland, Vt., is to install a 200-kilowatt turbine at Chittenden. A transmission line will be constructed to the Castleton substation.

ADAMS, MASS.—The Adams Woolen Mills will build a substation here in connection with the service to be given by the Connecticut Construction & Power Company.

BOSTON, MASS.—The Weymouth Light & Power Company has petitioned the Massachusetts Public Service Commission for approval to issue 1,900 shares of new capital stock at $160, to pay for improvements.

BOSTON, MASS.—The West End Street Railway Company has made application to the Public Service Commission for permission to issue bonds for $1,581,000, a large part of which it is planned to use for extensions and betterments in plant and system.

HARTFORD, CONN.—The Senate has passed a bill authorizing the Clinton Electric Light & Power Company to issue $100,000 in bonds, $70,000 of which will be used for construction and extensions.

ROCHESTER, N. Y.—The Northeast Electric Company has increased its capital from $600,000 to $1,000,000 for expansion.

SYRACUSE, N. Y.—The C. E. Lipe Estate, holder of the first mortgage on the property of the Union Springs Light & Power Company, has taken over the plant for operation.

CAMDEN, N. J.—The Pennsylvania Railroad is reported to be planning the electrification of its lines between Camden and Pemberton, and Camden and Trenton, using overhead electric system. All preliminary work and surveys will be completed within 12 months, when actual construction is to be commenced.

ENGLEWOOD, N. J.—The Board of Education will receive bids until May 15 for electrical work and equipment in connection with the erection of the new Lincoln school on Englewood Avenue. Guilbert & Betelle, 665 Broad Street, Newark, are the architects.

JERSEY CITY, N. J.—The City Commission is planning the installation of a new street-lighting system on West Side Avenue, from Montgomery to Jewett Avenue, and Communipaw to Grant Avenue. The Public Service Electric Company probably will make the improvement.

JERSEY CITY, N. J.—A meeting of the stockholders of the Havana Electric Railway, Light & Power Company has been called for May 17 at the local office of the company to approve an increase in the capital from $15,000,000 to $36,000,000 for expansion. H. Kraemer is secretary.

LAKEWOOD, N. J.—The Lakewood & Seacoast Railway is planning the early construction and completion of its proposed extension from Lakewood to Point Pleasant.

MIDVALE, N. J.—The Pompton Township Board of Education will receive bids until May 9 for electrical work and equipment in connection with general construction work for School No. 6, Bloomingdale. Oscar L. Fleetwood is district clerk.

NEWARK, N. J.—The Philadelphia Boiler Works, 1737 Filbert Street, Philadelphia, Pa., has secured a contract for $37,640 with the Public Service Electric Company for the installation of flues at the Essex power station.

PERTH AMBOY, N. J.—The Roessler & Hasslacher Chemical Company has commenced the erection of a new power plant at its chemical works on Fayette Street.

WEEHAWKEN, N. J.—The Union Hill Board of Council has disposed of a bond issue of $23,000 for the installation of a fire and police signal system.

ALLENTOWN, PA.—The Public Service Commission has granted permission to the Lehigh Valley Transit Company to acquire the Quakertown Traction Company.

ALLENTOWN, PA.—The Victor Leather Company will build a power plant for the operation of its new leather factory to be erected along Trout Creek. Franklin Haddock is president of the company.

CARLISLE, PA.—E. B. Beetem is having plans prepared for a one-story power plant, about 50 by 70 feet, to be used for factory operation. Andrew J. Sauer & Company are the architects.

DOYLESTOWN, PA.—The Public Service Commission has granted permission to the Bucks County Interurban Railway Company to acquire the Pennsylvania-New Jersey Electric Company and the Trenton City Bridge Company.

EASTON, PA.—The Pennsylvania Utilities Company is building a 33,000-volt transmission line to the Analomink Paper Mills at Stroudsburg, Pa., and the paper company is adding 600 horsepower to its present equipment of 250 horsepower. A new line is being extended to Shawnee to serve the famous Buckwood Inn and the surrounding summer colony of cottages. This service will add a load of about 75 kilowatts. The Pennsylvania Cement Company has nearly completed the installation of 2,000 kilowatts in motors, which will bring the total installation to 3,000 kilowatts. This mill is supplied from a 33,000-volt line from Easton.

FRANKLIN, PA.—The Citizens Light & Power Company of Oil City has purchased the property and franchises of the Franklin Electric Company, subject to the approval of the Public Service Commission.

HARRISBURG, PA.—The Board of Commissioners of Public Grounds and Buildings will receive bids until May 8 for power plant supplies, engineering and laboratory supplies, and other material for the coming year. L. W. Mitchell is secretary.

NEW BLOOMFIELD, PA.—The Public Service Commission has granted permission to the Perry County Telephone & Telegraph Company, Landisburg, for the construction of a new line from New Bloomfield to Newport.

PHILADELPHIA, PA.—The General Utilities & Operating Company, a Delaware corporation, has increased its capital from $1,500,000 to $3,000,000 for expansion.

SOUTH BETHLEHEM, PA.—Borough officials of Northampton Heights are planning the installation of an improved fire-alarm system.

STEELTON, PA.—The Borough Commissioners have awarded a contract to the Harrisburg Light & Power Company for the installation of tungsten lamps on Front Street to replace the present incandescent lighting system.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company has taken out a permit for the erection of its proposed new power plant at Race and Barney Streets. The structure will be two-story and estimated to cost $55,000.

CHILHOWIE, VA. — The Chilhowie Light & Power Company has been organized here with J. D. Tate as president and W. P. Vaughan secretary-treasurer. The company will furnish light for business houses and residences and power for small industries in and about Chilhowie.

CENTRAL, S. C.—The city has issued bonds for an electric-lighting system. S. D. Brown, of Toccoa, Ga., is preparing plans for the installation.

TAMPA, FLA.—It is announced that construction of an electric line between Tampa and Venice will be begun by West Coast Electric Railroad Company as soon as details of securing right of way can be completed. A. E. Townsend, of Tampa, is general manager of the company.

NORTH CENTRAL STATES.

CLEVELAND, O.—The Lake Shore Electric and the Cleveland, Painesville & Eastern traction companies have asked the Public Utilities Commission for permission to sell $51,000 and $68,000 worth of bonds, respectively, for proposed improvements.

DAYTON, O.—Bids will be received May 16 for water and heating systems and sewerage disposal system at the new Tuberculosis Hospital. The specifications include furnishing and erecting motor-driven pumping machinery. D. F. Garland is president.

GARY, IND.—Charles B. Davidson, receiver of the Gary & Interurban Traction Company, has been authorized to borrow $192,000 on receiver's certificates, the money to be used for new equipment and improvements.

HAMMOND, IND.—The Northern Indiana Gas & Electric Company, with headquarters in Hammond, in a petition filed with the Public Service Commission asks authority to issue and sell bonds in the sum of $609,000 and notes to the amount of $93,000. In addition to these issues the company asks authorization of the sale of $151,000 in bonds of the Indiana Lighting Company now held in the treasury of the former corporation. The refunding of former bond issues and extensions and betterments to equipment are given as the reason for the sale of the securities.

FORT WAYNE, IND.—The Fort Wayne & Decatur Traction Company has asked authority of the Public Service Commission to issue bonds to the amount of $100,000. The money will be used in meeting existing liabilities and in extensions and betterments to the company's system.

PARIS, ILL.—Plans to light the business district with cluster lamps have been revived, and it is probable that a system will be installed.

PRINCETON, ILL.—Business men here are advocating the installation of an ornamental electric-lighting system. According to Commissioner Thomas E. Wood, this would necessitate the purchase of another generating unit for the municipal plant to cost about $18,000. It is possible that a special election will be held to vote bonds to provide funds for the improvements.

SUMMIT, ILL.—Bonds in the sum of $6,000 have been voted for the installation of additional street lighting equipment.

ALPENA, MICH.—The City Council

plans the installation of electric-lighting units in the business district.

BOYERVILLE, WIS.—The Glenwood-Downing Light & Power Company is planning to extend its service to this place.

FOTOSI, WIS.—Plans are being made here for a municipal electric-lighting system.

FARWELL, MINN. — The Glenwood Electrc Light, Heat & Power Company has been granted a franchise to install and operate an electric light and power plant here.

DYERSVILLE, IOWA.—Plans are being considered by the Eastern Iowa Electric Company to establish a rural line into the vicinity known as Hickory Valley, to furnish electric light and power to farmers along the line. The company has begun the installation of a distribution system in New Vienna.

NASHUA, IOWA.—The Cedar Valley Electric Company is planning to erect a new office building here.

RUTHVEN, IOWA.—Citizens here will vote on the proposition of giving the Northern Gas & Power Company a franchise for furnishing electric service in that city. The election will be held May 5.

SIOUX CITY, IOWA.—Announcement has been made of plans whereby the capacity of the Sioux City Gas & Electric Company's plant will be almost doubled. Improvements to cost $250,000 will be started soon. The plans call for an addition of a 3,000-kilowatt turbogenerator, which will bring the total capacity of the station up to 8,000 kilowatts. Part of the old boiler room will be rebuilt and a new addition to the station erected to make room for the new equipment.

BARNARD, KANS.—F. E. Justice, of Lincoln, has been granted a 20-year franchise to furnish electric service here.

INDEPENDENCE, KANS.—The Interstate Traction Company has been organized here to build an electric railway from a point near Jefferson, eight miles south of Independence, to Collinsville, Okla., by way of Tyro and Caney, Kans., and Copan. Dewey and Bartlesville, Okla. It will then be run across to Nowatoa to join the Union Traction Company's line to that town. A. W. Schulthies, of Independence, is president of the Interstate company.

KANSAS CITY, KANS.—The city is planning to replace 500 gas lamps with electric-lighting units.

MALTA BEND, KANS.—An electric-lighting system is planned for this town.

CARROLLTON, MO.—The local white-way system may be extended at a cost of about $1,000.

VALLEY PARK, MO.—An electric-lighting system may be installed here soon.

FULLERTON, NEB. — The Fullerton Electric Light & Power Company contemplates installing a gas engine and generator, and also additional equipment for its hydroelectric plant.

VOLIN, S. D.—The Citizens' Light & Power Company, which furnishes service here, has decided to increase the capacity of the local plant.

RYDER, N. D.—E. E. Freedeen, owner of the local electric plant, plans to change his plant from direct to alternating current.

STEELE, N. D.—Business men of this city have formed a stock company and purchased the Goodwin Light & Power Company. The company will be capitalized at $20,000, and will be known as the Steele Electric Company. H. B. Allen, J. C. Loerch and E. B. Miller are the principal incorporators.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—The city has closed a new street-lighting contract with the Lexington Utilities Company on a basis which, it is said, will save the city $10,000 a year in its outlay for lighting. The rates on arcs are reduced from $74 to $60 from April 1, this year, and new rates for modern incandescent lamps established. All of the existing arcs are to be removed by the end of the year and replaced with new types of street lamps.

WINCHESTER, KY.—The Court of Appeals has sustained the validity of the bond issue of $180,000 voted some months ago for establishment of a municipal waterworks. The plans of the engineers contemplate a hydro-electric plant on the Kentucky River to supply the power for pumping the water to the city.

DATES AHEAD.

American Electrochemical Society. Spring meeting, Hotel Statler, Detroit, Mich., May 2-5. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Fire Protection Association. Annual meeting, Washington, D. C., May 8-10. Secretary-treasurer, Franklin H. Wentworth, 87 Milk Street, Boston, Mass.

Arkansas Association of Public Utility Operators. Annual convention, Pine Bluff, May 16-18. Secretary-treasurer, R. B. Fowles, Pine Bluff Company, Pine Bluff, Ark.

Missouri Association of Public Utilities. Annual meeting, aboard Steamer Quincy enroute from St. Louis, May 17-19. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Electrical Supply Jobbers' Associations. Semi-annual meeting, Homestead Hotel, Hot Springs, Va., May 23-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Iowa Section, National Electric Light Association. Annual convention, Des Moines, Iowa, May 24-25. Secretary, L. E. Caldwell, Iowa City, Iowa.

Electric Power Club. Spring meeting, Homestead Hotel, Hot Springs, Va., June 11-14. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Electrical Contractors' Association of Pennsylvania. Annual convention, Philadelphia, Pa., June 19-21. Secretary, M. J. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Chemical Engineers. Semi-annual meeting, Buffalo, N. Y., June 20-22. Secretary, J. C. Olsen, Cooper Union, New York City.

American Institute of Electrical Engineers. Annual meeting, Hot Springs, Va., June 26-29. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Breakers Hotel, Cedar Point, O., July 16-20. Secretary, D. L. Gaskill, Greenville, O.

BIRMINGHAM, ALA.—The City Commissioners are making preliminary plans for an addition to the electric light and power plant at North Birmingham.

OAK GROVE, LA.—The city will install an electric-lighting plant.

OKLAHOMA CITY, OKLA.—The Chamber of Commerce is interested in plans for the installation of white-way system on Broadway.

SULPHUR, OKLA.—The Sulphur Ice, Light & Power Company has finished remodeling and enlarging its plant and has installed an oil-burning Deisel engine of the latest type. The company has inaugurated 24-hour service.

WOODWARD, OKLA.—The City Council is considering the purchase of the light and power plant now owned by the Woodward Cotton Company, which has been furnishing the city with light and power for a number of years.

RYAN, OKLA.—The local power plant may be sold and a franchise granted to the Consumers' Light & Power Company, of Chicago.

CELINA, TEX.—The municipal electric light and power station and waterworks plant here have been destroyed by fire, entailing a loss of about $20,000. They will be rebuilt.

COPPERAS COVE, TEX.—C. W. Roberts has been granted a franchise to furnish electric light and power here.

CORPUS CHRISTI, TEX.—W. J. O'Brien, manager of the Corpus Christi Railway & Light Company, has announced that additional equipment will be installed and other improvements made to the property.

DALLAS, TEX.—J. W. Rogers and other property owners on South Ervay street plan to install an ornamental lighting system on that street.

LAMPASAS, TEX. — The Lampasas Light & Power Company is planning to furnish 24-hour service here.

MERTZEN, TEX.—An electric-lighting plant has been installed to supply the business district with service.

POLYTECHNIC, TEX.—The city is making plans for improvements to the local electric street-lighting system.

SAN ANGELO, TEX.—The Interstate Electric Corporation, which was granted a franchise some time ago by the City Council for the construction of an electric street railway system here, will build its power plant as soon as the necessary machinery and equipment can be obtained. It expects to begin the construction of the track within the next few weeks.

SEMINOLE, TEX.—W. M. Breckon will install an electric-lighting system here.

WELLINGTON, TEX.—The Wellington Power & Light Company will rebuild its power plant, which was destroyed by fire recently. The new plant will cost about $15,000.

WICHITA FALLS, TEX.—The County Commissioners will receive bids May 1st for the electrical work and lighting fixtures for the new courthouse here.

WESTERN STATES.

OSWEGO, MONT.—The Knight Electric Company, of Glasgow, was awarded the contract for furnishing and installing the local electric plant at $7,800.

GALLUP, N. M.—The Mutual Coal, Light & Power Company has been incorporated in Delaware with a capital of $2,500,000 to construct electric light and power plants. George A. Keeper, who was granted a 25-year franchise to supply electric service here, is one of the incorporators, the others being James A. Sueggon and C. C. Manning, all of Gallup.

GLOBE, ARIZ.—The Globe-Miami Electric Railway Company has been incorporated for the purpose of constructing an interurban electric line between Globe and Miami, a distance of eleven miles. A survey for the proposed road is now being made and construction will be started about July 1, it is announced. The officers of the company are as follows: President, Harvey T. Lynch, of Independence, Iowa; vice-president, J. J. Mackey, of Miami; secretary-treasurer, Edgar Sultan, of Globe; general manager, Frank J. Dains, of Kansas City, Mo.

YUMA, ARIZ.—F. L. Ewing has applied to the City Council for permission to erect a power line through Yuma from the Colorado River to the Yuma ice plant.

PALISADE, IDAHO — The Palisade Electric Light & Power Company has been organized here by W. D. Harris, H. R. Meakins, Alva Reed and others and is making plans for furnishing electric service in this vicinity.

MURRAY, WASH.—The Giant Ledge Mining Company, of which Charles G. Taylor is manager, expects to install an electric plant at its mine near here.

PASCO, WASH.—The County Commissioners have granted a 50-year franchise to the Pacific Power & Light Company to construct electric transmission lines in the county.

SHELTON, WASH.—The Mason County Power Company has filed application for a franchise to erect transmission lines in Mason County.

SPOKANE, WASH.—Construction of a high-tension transmission line from its plant at Long Lake, 25 miles down the Spokane River from this city, to Northport, Wash., is under consideration by the Washington Water Power Company, according to D. L. Huntington, its president. The line will be 90 miles long and will furnish power to the smelter operated by the Northport Smelting & Refining Company.

BAKER CITY, ORE.—The Baker Mines Company has secured a franchise to construct a power line from Halfway to Cornucopia for the purpose of furnishing power for the operation of the company's mine.

BEND, ORE.—The Bend Water, Light & Power Company will erect an addition to its plant, to cost $3,000.

JACKSONVILLE, ORE.—The Southern Oregon Traction Company has secured a franchise from the City Council for the construction of a street railway system.

KLAMATH FALLS, ORE.—The City Council has called for bids for the construction of the Klamath Falls municipal railway, which will extend from Second Street and Klamath Avenue to a point near Dairy Station, twenty miles east of Klamath, and will form a link in the Oregon, California & Eastern railroad.

PORTLAND, ORE.—The Board of Education has called for bids on the electric wiring of the Hoffman school.

ARCADIA, CAL.—The Board of Trustees has awarded the contract for the installation of 29 ornamental lighting standards and equipment to the Southern California Edison Company.

BIG PINE, CAL.—Plans are completed for an electric railroad and power line from Olanch to the property of the Darwin Lead & Silver Mines & Development Corporation at Darwin.

BLYTHE, CAL.—Application for permission to extend its lines 90 miles to Blythe has been filed with the Railroad Commission by the Southern Sierras Power Company. Poles and wire have already been purchased for the improvements. It is proposed temporarily to generate power in Blythe for local consumption, later tying the city with the company's main line.

GLENDALE, CAL.—The bid of the city of Glendale for furnishing additional lights and supplying energy for the Verdugo lighting district has been accepted by the Board of Supervisors.

OROVILLE, CAL.—The Pacific Gas & Electric Company is rebuilding the substation on the Marysville road which was destroyed by fire two years ago.

OROVILLE, CAL.—Present indications are that the location survey for the power plant that the Great Western Power Company is to build above Oroville will be completed within the next month. The survey has progressed from the point that the dam will be constructed near the junction of the north fork and the west branch to a point on the north fork opposite Bidwell Bar.

OROVILLE, CAL.—The Pacific Gas & Electric Company has started reconstruction work on its plant at the foot of Huntoon Street. The company will replace the lighting equipment in the business section of Oroville with a modern system.

LOS ANGELES, CAL.—With the taking over of Pacific Light & Power Company, which will be as soon as the merger is approved by the State Railroad Commission, the Southern California Edison Company is planning still further extension of its hydroelectric generating facilities. The company has applied to the State Water Commission for the right to appropriate water from the North Fork of the Kern River and from Salmon Creek in Tulare County for the generation of electric power. These water rights were acquired by the California Power Company in 1901 and 1902 and since that time the Southern California Edison Company has expended $881,104 in their development. The cost of the proposed new development is given as $4,118,295. The new development will be Kern River plant No. 3 and will involve a diversion dam 60 feet high and 240 feet long, of steel and concrete construction. Power will be developed by two turbines directly connected to generators of 25,000 kilowatts each, giving the new plant 30,000 kilowatts' initial capacity. The total fall to be utilized is 800 feet, and the amount of available power development is in excess of 54,000 horsepower. The new plant is to supplement existing plans of the company to meet the increased demand for electricity for light and power, and the company asks that it be given until July 1, 1922, to complete the work of construction.

LOS ANGELES, CAL.—The Board of Education has called for bids for the installation of electric fixtures in the Jefferson high school.

LOS ANGELES, CAL.—A $12,000,000 power bond issue will be submitted to the people at the coming general election on June 5.

LOS ANGELES, CAL.—Plans have been completed for a new ornamental lighting system to be installed on Broadway from the Tunnel to Tenth Street.

LOS ANGELES, CAL.—The city of Los Angeles has purchased the distributing systems of the Southern California Edison and the Pacific Light & Power companies.

LOS ANGELES, CAL.—The city has filed three applications asking permission to appropriate water at three different points for the purpose of generating electric power.

RED BLUFF, CAL.—The Northern California Power Company has purchased the V. B. Taylor power plant and water rights located near Manton.

WILLOWS, CAL.—The Central Sacramento Irrigation Project has called for bids for furnishing electric equipment for the Sidds Landing substation.

INCORPORATIONS

NEW YORK, N. Y.—Schuster Engineering Company of New York, Inc. Capital $100,000. To install electric systems and engage as electrical engineers and contractors. Incorporators: H. A. Bellows, C. G. Grossmann, K. R. Schuster, 21 Park Row.

JERSEY CITY, N. J.—Electric Lamp & Products Company. Capital, $40,000. Manufacture electric lamps and similar products. Incorporators: A. W. Britton, H. B. Davis and S. B. Howard, New York City. Local representative, W. Kauffmann, 513 Paterson Plank Road.

DAYTON, O. — The Lesher Electric Company. Capital, $5,000. Incorporators: Chester Lesher, W. D. Black, G. L. Coleman and others.

WILMINGTON, DEL.—American Electric Share Company. Capital, $2,200,000. Deal in investments. Incorporators: Herbert E. Latter, C. L. Rimlinger and Clement M. Egner.

NEW YORK, N. Y.—Foote, Pierson & Company. Capital, $100,000. Manufacture all kinds of electrical machinery; general contracting. Incorporators: Henry G. Pierson, M. N. Liesman and William R. Stout.

DOVER, DEL.—National Electric Light & Power Company. Capital, $5,000,000. To operate utility plants. Incorporators: H. Lindale Smith, Cleveland, O.; Homer J. Smith and George M. Fisher, Jr., Wyoming, Del.

DOVER, DEL.—Mancha Storage Battery Locomotive Company. Capital, $300,000. To manufacture and operate storage-battery locomotives and other electric devices. Incorporators: Herbert E. Latter and C. M. Rimlinger, Wilmington, Del.; Clement M. Egner, Elkton, Md.

NEW YORK, N. Y.—Electrolytic Engineering Corporation. Capital, $50,000. To deal in apparatus and machinery for distributing energy for light, heat and power. Incorporators: P. R. Gordon, A. Heyert and M. Kirschberg, 170 Broadway, New York.

NEW YORK, N. Y.—Whitestone Electric & Manufacturing Company. Capital, $30,000. Manufacture scientific apparatus, etc. Incorporators: A. T. Sommer, 302 West 103d Street; Henry Herzbrun, 60 Wall Street; Otto Sampter, 240 West 102nd Street.

BROOKLYN, N. Y.—Billwood Electrical Contracting Company. Capital, $5,000. Incorporators: J. F. Duffy, 238 East Twenty-seventh Street, New York City; Fred Holman, College Point; John J. Reilly, 115 West Forty-third Street, New York City.

PITTSBURGH, PA.—The Railway Electric Switch & Supply Company. Capital, $1,500,000. Manufacture and sell electrical railway switches, etc. Incorporators: Wilber A. McCoy, Pittsburgh, Pa.; Charles H. Jones and W. I. Lofland, Dover.

CINCINNATI, O.—The Devere Electric Company has increased its capital from $10,000 to $125,000.

FINANCIAL NOTES

Crocker-Wheeler Company, Ampere, N. J., manufacturers of electrical machinery, made record earnings for the first quarter of 1917. The dividends on both classes of stock have been earned for the year and a substantial amount added to the surplus, which is now near the million mark. The preferred stock pays seven per cent and the common eight per cent regularly. The company has just paid an extra dividend of one per cent on the common stock. At the present rate the profits, after paying dividends on the preferred stock, would represent $44.17 per share for the year. The "book value" of the common stock on March 31, after setting aside the dividend for the preferred stock, which is callable at 108, is $151.43 per share.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate, per cent.	Bid Apr. 16.	Bid Apr. 23.
Public utilities—			
Adirondack Electric Power of Glens Falls, common	..	25	25
Adirondack Electric Power of Glens Falls, preferred	6	80	80
American Gas & Electric of New York, common	10+extra	136	130
American Gas & Electric of New York, preferred	6	50¾	50
American Light & Traction of New York, common	..	330	324
American Light & Traction of New York, preferred	6	110	111
American Power & Light of New York, common	4	82	80
American Power & Light of New York, preferred	6	88½	88
American Public Utilities of Grand Rapids, common	..	36	35
American Public Utilities of Grand Rapids, preferred	6	69	68
American Telephone & Telegraph of New York	..	123⅛	124
American Water Works & Elec. of New York, common	..	14	10
American Water Works & Elec. of New York, particip.	7	30	30
American Water Works & Elec. of New York, first preferred	..	81	86
Appalachian Power of Bluefield, common	..	6¼	6¼
Appalachian Power of Bluefield, preferred	7	35	35
Cities Service of New York, common	6+extra	292	285
Cities Service of New York, preferred	6	87	87
Commonwealth Edison of Chicago	8	132	131
Comm. Power, Railway & Light of Jackson, common	4	56	54½
Comm. Power, Railway & Light of Jackson, preferred	6	80	79
Federal Light & Traction of New York, common	..	12½	12
Federal Light & Traction of New York, preferred	..	48	45
Illinois Northern Utilities of Dixon	6	80	80
Middle West Utilities of Chicago, common	2+2 extra	54⅞	54
Middle West Utilities of Chicago, preferred	6	76	75¼
Northern States Power of Chicago, common	7	97	97
Northern States Power of Chicago, preferred	7	98	98½
Pacific Gas & Electric of San Francisco, common	5	62¼	60
Pacific Gas & Electric of San Francisco, preferred	6	91	91½
Public Service of Northern Illinois, Chicago, common	7	107	104
Public Service of Northern Illinois, Chicago, preferred	6	98½	98
Republic Railway & Light of Youngstown, common	4	36½	35½
Republic Railway & Light of Youngstown, preferred	6	68	67
Standard Gas & Electric of Chicago, common	..	12¼	12
Standard Gas & Electric of Chicago, preferred	6	38½	37
Tennessee Railway, Light & Power of Chattanooga, common	..	7	7
Tennessee Railway, Light & Power of Chattanooga, preferred	6	32	29
United Light & Railways of Grand Rapids, common	4	42	43
United Light & Railways of Grand Rapids, preferred	6	73	73
Western Power of San Francisco, common	..	15	15
Western Power of San Francisco, preferred	6	57	54
Western Union Telegraph of New York	5+extra	96	96
Industrials—			
Electric Storage Battery of Philadelphia, common	4	62	62
General Electric of Schenectady	8	164¾	162
National Carbon of Cleveland, common	8	†300	†300
National Carbon of Cleveland, preferred	7	†135	†135
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	48¾	48
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	70	65

†Last sale.

share. The company has been constantly and quietly increasing its equipment, which is reflected in its monthly statement.

The Indiana Public Service Commission has granted authority to the Northern Indiana Gas & Electric Company to issue bonds, to be sold at 92; $151,000 of Indiana Lighting Company four-per-cent bonds at 80, and $93,000 of six-per-cent notes at par value. The petition for such action was filed by the company, which now is operated by C. H. Geist, some time ago and a hearing was held recently.

The gross earnings of Cities Service Company for the twelve months ended March 31, 1917, $13,391,411, were the largest in the company's history, being more than 2.5 times as much as the figures for the preceding year. The balance for the common stock was $10,213,988, or 3.5 times as much as the balance for the common for the previous twelve months. For the twelve months ended March 31, 1917, the preferred dividend requirements were earned 4.67 times, compared with 4.48 times for the twelve months ended February 28, 1917, and 2.74 times for the twelve months ended March 31, 1916. Likewise 48.37 per cent was earned on the common stock, compared with 44.81 per cent and 18.78 per cent respectively. In the month of March gross earnings were $1,721,481, or 2.75 times as much as March, 1916, and the balance of the common stock totaled $1,390,937, or more than three times as much as the previous March. During March the preferred dividend requirements were earned 5.75 times, leaving a balance at the annual rate of 71 per cent on the $23,350,546 of common stock outstanding in the hands of the public on March 31, 1917. The total surplus and reserves of the company are $14,970,704. During the first quarter of the current year these total surplus and reserves increased more than $15 for each share of Cities Service common stock owned by the public, or at the monthly rate of approximately $5 a share. Due to the conversion of the outstanding debentures, each succeeding earnings statement has revealed a decrease in the interest charges of the company until for the month of March they were only $224.88. On March 31, 1917, Cities Service Company had but $58,350 of the five per cent convertible debentures unconverted into stock. In accordance with the recent amendment to the certificate of incorporation $18,449,468 of surplus earnings had become available for reinvestment in the properties up to March 31, 1917, the surplus earnings for the month of March being $1,275,013.

Reports of Earnings.

COLORADO POWER.

The Colorado Power Company has issued a comparative statement of earnings and expenses for February and for the twelve months ending February 28, 1916, and 1917, as follows:

February—	1917.	1916.
Gross earnings	$89,537	$68,205
Operating expenses and taxes	36,795	29,767
Net earnings	52,742	38,438
Other income	1,055	1,328
Total income	53,796	39,766
Operating ratio	41.0%	43.5%
Twelve months—	**1917.**	**1916.**
Gross earnings	$1,063,794	$858,036
Operating expenses and taxes	470,915	341,688
Net earnings	592,879	516,347
Other income	37,265	32,750
Total income	630,144	549,097
Interest and funded debt	220,179	207,186
Depreciation reserve	105,848	84,104
Net income	304,117	257,808
Preferred dividends	41,300	29,726
Common dividends	221,264	110,632
Surplus	41,553	117,450
Operating ratio	44.4%	39.7%

UNITED STATES PUBLIC SERVICE.

The United States Public Service Company has issued a statement of the combined earnings of subsidiary companies for the years ended December 31, 1915 and 1916, as follows:

	1916.	1915.
Gross earnings	$917,482	$692,997
Operating expenses and taxes, including maintenance	545,579	406,083
Net earnings	371,903	286,914
Miscellaneous income	22,321	24,076
Total corporate income	394,224	310,990

PROPOSALS

ELECTRICAL EQUIPMENT.—Bids will be received until May 1 by the War Department, Office of the Chief Signal Officer, Washington, D. C., under proposal 969, for furnishing one 125-kilowatt motor-generator set, one 40-horsepower induction motor, one 25-kilowatt generator, one starting compensator and one two-panel switchboard. Further information can be obtained from Major Charles S. Wallace, Signal Corps, U. S. Army.

TURBINE AND GENERATOR. Sealed bids endorsed "Proposals for vertical hydraulic turbine, Division A," and "Proposal for alternating-current generator, Division B," will be received until May 17 by the Sanitary District of Chicago, 910 South Michigan Avenue, Chicago, Ill. The work for which said tenders are invited is covered by the specifications and the turbine and generator is to be installed in the power house at Lockport, Ill. John McGillen, Clerk of the Sanitary District of Chicago.

Electrical Patents Issued April 17, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,222,593. Art of Producing Aluminum Carbid. M. Barnett and L. Burgess, New York. Comprises heating a mixture of carbon and alumina by a carbon resister therein.

1,222,599. Electric Coupling Device. T. R. Brown, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Details of electric train-line coupling.

1,222,628. Globe Holder. H. R. Humphrey, Kalamazoo, Mich. Special structure of spring-grip device for engaging the rim of the globe.

1,222,630. Aerial-Torpedo Steering Mechanism. L. J. Husted, Kansas City, Mo. An aerial missile has a depending magnetic controller connected with direction-controlling blades directing the missile to a magnetically attractive object.

1,222,633. Centrifugal Switch. C. L. Kennedy, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. Structural details of device for mounting on rotating shaft.

1,222,634. Signal Device for Electric Railway Cars. J. E. Keppel, St. Louis, Mo. Failure of main current automatically lights projector, which illuminates trolley.

1,222,637. Electrochemical Treatment of Liquids. C. P. Landreth, Philadelphia, Pa. Hard water is treated by passing current through it and introducing hydroxid for precipitating salts.

1,222,658. Advertising or Signaling Apparatus. J. P. Naylor, Dulwich, England. Changeable electric display mechanism.

1,222,669. Electric Bathtub Heater. J. W. Purnell, Morristown, Tenn. Immersion device for hanging on side of tub.

1,222,676. Electric Candlestick. A. J. Sanford, assignor to A. H. Heisey & Co., Newark, O. Structure molded with conductor passages.

1,222,692. Reverse-Phase Safety-Relay for Motor Circuits. C. H. Spangler, Reading, Pa., assignor of one-half to C. C. Long, Reading, Pa. Structure of magnetically operated circuit-breaker.

1,222,714. Electric Switch. G. Baehr, McKeesport, Pa., assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Details of electromagnetically operated device.

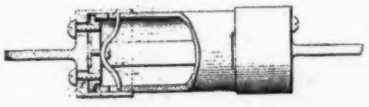
1,222,720. Automatic Switch. J. Bijur, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Pole-changer operated by dynamo shaft through magnetic attraction.

1,222,721. Electrical Connection. C. H. Bissell and E. G. Smith, assignors to Crouse-Hinds Co., Syracuse, N. Y. Structure plug and socket for connecting conductors.

1,222,740. Trolley Mechanism. E. C. Dietrich and C. W. Bliss, South Bend, Ind. Structure of pole-base.

1,222,749. Shade-Holder. T. Euphrat, South Norwalk, Conn. Details of ring for gripping shade rim.

1,222,761. Oscillator. C. D. Herrold, San Jose, Cal. Relates to the structure and arrangement of electrodes in an imperfectly conducting fluid.



No. 1,222,937—Inclosed Fuse.

1,222,766. Light-Controlling Mechanism for Photographic Apparatus. W. C. Huebner, assignor to Huebner-Bleistein Patents Co., Buffalo, N. Y. Relates to control of motor-operated shutter and electric lamp.

1,222,768. Spark-Plug-Insulating Means. W. F. Johnston, West Carrollton, O. Structure of device having bakelite insulation.

1,222,771. Telegraphic Receiving Organism. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Details of apparatus in a system where a series of pulses are transmitted for each signal.

1,222,784. Screw-Threaded Bulb-Mold. F. J. Moloney, Corning, N. Y. For making incandescent lamp bases.

1,222,790. Telephone Transmitter. J. G. Nolen and R. L. McElroy, assignors to Magnetic Phonograph Co., New York, N. Y. For recording and reproducing sound waves in connection with phonographs.

1,222,803. Rectifying Device. C. C. Ruprecht, Midway, Fla. Details of device having contacts operated by combination of alternating and fixed polarity magnets.

1,222,809. Gas-Generator. L. P. Sebille, Providence, R. I. Electrolytic generator of hydrogen and oxygen.

1,222,810. Protective System for Composite Circuits. T. Shaw, assignor to American Telephone & Telegraph Co. The protected circuit and primary circuit are interconnected by a transformer having a winding in a ground lead of the primary circuit.

1,222,827. Coiling Apparatus. W. R. Webster, assignor to Bridgeport Brass Co., Bridgeport, Conn. End of strip is magnetically secured to winding block with automatic control of the magnetism.

1,222,837. Portable Electrical Device. E. R. Winslow and C. A. Jones, Kearney, Neb. Unitary structure comprising a fan and a lamp secured to a plug so as to be adapted to be secured in a lamp socket.

1,222,852. Controller for and Method of Regulating Electric Motors. H. E. Day, Jersey City, N. J. For controlling the speed of direct-current series motors.

1,222,853. Selecting System. A. F. Sixon, assignor to Western Electric Co. Relay arrangement for telephone systems.

1,222,854. Operating Box-Controlled Dumbwaiter System. E. L. Dunn, assignor to Standard Plunger Elevator Co., Worcester, Mass. Special speaking transmitting means between the controller station and the various floors, for sending instructions, is provided.

1,222,861. Method of and Apparatus for Electrotanning. L. A. Groth, London, England. Manner of treating hides in a tannic electroconductive bath.

1,222,869. Magneto. F. R. Hoyt, assignor to Simms Magneto Co., East Orange, N. J. Structural details.

1,222,879. Telephone System. A. E. Lundell, assignor to Western Electric Co Intercommunicating system.

1,222,885. Induction-Coil Controller. M. P. Mitchell, Eaton, O. An auxiliary coil operates a switch on overcharge to shunt a portion of one of the windings.

1,222,886. Electric Switch for Lamp-Sockets, Etc. S. Morris and M. Guett, assignors to Hart & Hegeman Mfg. Co., Hartford, Conn. Structural details.

1,222,895. Automatic Phonographic Responding and Receiving Device. F. Seelau, Berlin-Wilmersdorf, Germany, assignor of one-half to A. M. Newman, Berlin-Wannsee, Germany. For telephone exchanges.

1,222,900. Alternating-Current Magnet. W. S. Smith, Cambridge, Mass. Relates to the adjustability of circuit-breaker magnets.

1,222,915. Electric-Light Stand. R. D. H. Anderson, assignor to F. Ridlon Co., Boston, Mass. Details of vertically adjustable telescoping standard.

1,222,915. Ionized-Chamber Device. C. D. Babcock, assignor of one-half to J. Neilson, New York, N. Y. Details of structure and arrangement.

1,222,937. Fuse. A. F. Daum, Pittsburgh, Pa. Inclosed, having fusible element clamped between cap and shell. (See cut.)

1,222,945. Medical Apparatus. O. Hammerstein, New York, N. Y. Details of electrically heated and lighted rotary drum for receiving the affected part.

1,222,947. Electric Switch. G. H. Hart, West Hartford, Conn. Details of snap-switch.

1,222,948. Marking Implement. E. A. Hawthorne, Bridgeport, Conn. Combined flashlight and pencilholder.

1,222,952. Fuse Device. A. Herz assignor one-half to E. O. Schweitzer, Chicago, Ill. Structure of fuse box.

1,222,982. Brush and Holder for Generators and Motors. J. B. Peters, assignor to Electric Auto-Lite Co., Toledo, O. For holding and connecting carbon brushes.

1,222,986. Circuit-Controlling Telephone-Receiver Support. W. Pick, New York, N. Y. Structural details.

1,222,999. Commutator Brush. H. K. Sandell, assignor to H. S. Mills, Chicago, Ill. Cast from alloy of copper, antimony and nickel.

1,223,000. Means for Rectifying Alternating Current for Edison Three-Wire Distribution System. H. K. Sandell, assignor to Herbert S. Mills, Chicago, Ill. Combination of transformer and commutator.

1,223 002. Metal Composition. H. K. Sandell, assignor to H. S. Mills. Cast metal make-and-break contact point, comprising upward of 70 per cent nickel and upward of 3 per cent graphitic carbon.

1,223,020. Telephone System. W. Aitken, assignor to Relay Automatic Telephone Co., Ltd., London, England. Relates to grouping of incoming lines.

1,223,060. Signaling Device. C. O. Louthan, Kansas City, Kan. Throttle mechanism and signal are controlled by doors of hood of automobile.

1,223,089 and 1,223,090. Sheet-Metal Rod or Shaft. T. E. Murray, New York, N. Y. First patent: Sheet metal rings are electrically welded together edge to edge. Second patent: Channeled rings of sheet metal are placed successively and electrically welded.

1,223,091. Method of Making Hollow-Metal Objects by Electrical Welding. T. E. Murray and H. R. Woodrow, New York, N. Y. Method of welding bodies seated in and free to tilt in matrix electrodes.

1,223,092. Electric Welding Apparatus. T. E. Murray, New York, N. Y. Structure of electrode.

1,223,094. Dynamoelectric Machine. A. H. Neuland, Bergenfield, N. J. Details of commutator machine.

1,223,095. Induction Power-Transmitting Device. A. H. Neuland, Bergenfield, N. J. Structure of stator and rotor with an induction winding in the magnetic field which is cut by lines of force when stator and rotor are not in synchronism.

1,223,096. Dynamoelectric Machine. A. H. Neuland, New York, N. Y. Details of magnetic structure.

1,223,111. Connection-Box and Plugging-Jack. H. F. Richardson, assignor to said H. F. Richardson and C. Auth, trustees, Brooklyn, N. Y. Details of terminals, connections, etc., in device having pair of blocks, one with plugs and other with sockets.

1,223,114. Electrolytic Rectifier. C. C. Ruprecht, Midway, Fla. Has special provision for drawing off sediment.

1,223,117. Electrothermostatic Controller. J. C. Schaf, Jr., and W. H. Munk, assignors to H. E. Welchel, Indianapolis, Ind. Structure of device having contacts controlled by electrical heating coil.

1,223,124. Vaporizer and Igniter for Internal-Combustion Engines. A. W. Thompson, Ottawa, Ontario, Canada. Combined structure, electrically heated, for mounting on cylinder.

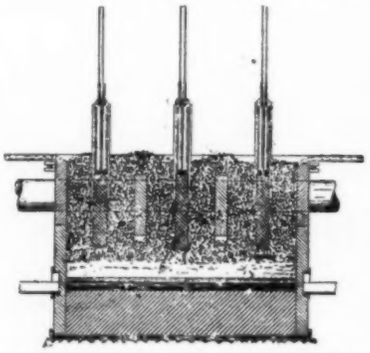
1,223,130. Device for Suspending Light-Reflecting Bowls. E. L. White, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. For lamp-socket attachment.

1,223,134. Electric-Lighting System. S. F Arbuckle, Indianapolis, Ind. For automobiles.

1,223,143. Vibrator Contact. S. F. Briggs, assignor to Briggs & Stratton Co., Milwaukee, Wis. Electromagnetically actuated device.

1,223,167. Battery Receptacle. E. A. Hawthorne, Bridgeport, Conn. Casing for battery switch, etc.

1,223,169. Remote-Control System. C. J. Henschel, Bloomfield, N. J. Remote control signaling system wherein a signal



No. 1,223,278—Multiple-Hearth Electric Furnace.

operating mechanism is controlled by several circuits selectively adapted for such control.

1,223,177. Speedometer-Controlled Ignition Circuit-Breaker. J. W. Johnson, Pine Bluff, Ark. For motor vehicles.

1,223,180. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Iron wire in main circuit increases in resistance and prevents excessive current flow when there is a dwell of the interrupter in closed position.

1,223,183. Direction-Indicator. W. H. Larsen, Racine, Wis. For automobiles; details of illuminated casing.

1,223,188. Spark-Plug. J. E. Manlove, Plymouth, Ill. Structure having provision for priming.

1,223,214. Photoprinting-Machine. F. L. Stuber, South Bethlehem, Pa. Has support for printing frame and two lamps, to either of which exposure is made, with provision for automatically lighting the lamp employed.

1,223,217. Trolley-Wheel. C. H. Taylor, Sawtelle, Cal. Has special provision for lubrication.

1,223,222. Electrical Multiple Connector. C. H. Tomlinson, assignor to Tomlinson Coupler Co., Mansfield, O. Plug and socket structure for coupling train lines, etc.

1,223,223. Automatic Car, Air and Electric Coupling Mechanism. C. H. Tomlinson, Mansfield, O. Coupling system for air lines of cars comprising electrically controlled valves.

1,223,224. Apparatus for the Electrical Transmission of Power. H. B. Van Daalen and H. P. Schreiber, London, England. Relates to control of motor-generator set acting as transmission from engine.

1,223,255. Electrical Protective System. W. G. Chapman, Huntington, W. Va. Electrical control of camera shutter and flashlight.

1,223,278. Multiple-Hearth Electric Furnace. A. Helfrenstein, assignor to Union Carbide Co. Structure and arrangement of electrodes, packing, gas outlets, etc. (See cut.)

1,223,288. Wire-Conduit Metal Base. O. M. Otte, Jamestown, N. Y. Structure of molding having a wire conduit.

1,223,304. Control-Circuits for Telephone Systems. F. Aldendorff, Wilmersdorf, Berlin, Germany. Switching system for interconnecting lines.

1,223,306. Electrical Measuring Instrument. W. Anthony, Clyde, O. Simple structure of current-indicating instrument.

1,223,313. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. Car-lighting system.

1,223,348. Process of Making Laminated Articles. A. J. Bastian, assignor to Westinghouse Electric & Mfg. Co. Properly shaped sheets of fibrous material are placed in a mold with phenolic condensation product and heat and pressure are applied.

1,223,349. Telephone System. F. W. Dunbar, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of jacks, cord circuits, selective switches, etc., at exchange.

Reissue 14,284. Switch-Box. J. Z. Bayliss and C. Raus, assignors to Acme Metal Stamping Co., Cleveland, O. Structural details of outlet box.

Reissue 14,286. Electric Heating Pad. N. E. Mann, assignor to Reliance Electric Heating Co., Columbia, Pa. Circuits and control of heating resistors.

Reissue 14,288. Automatic Fire and Burglar Alarm. L. A. Meyers, Sauk Center, Minn., assignor of one-half to Volunteer Firemen's Signal Co. Alarm attachment for telephone systems.

PATENTS EXPIRED.

The following United States electrical patents expired on April 12, 1917:

647,932. Electromagnetically Operated Railway Switch. F. E. Baldwin, New York, N. Y.

647,940. System of Train Control. H. W. Buck, Schenectady, N. Y.

647,945. Support for Electric Conductors. T. J. Cope, Philadelphia, Pa.

647,946. Electric Igniter for Gas Engines. W. H. Cotton, Chicago, Ill.

647,970. Apparatus for Indicating Leakage of Current from Electric Conductors. M. Kallmann, Berlin, Germany.

647,975. Automatic Feeding and Regulating Device for Machine Tools. H. A. Liebert and E. H. Liebert, Milnrow, England.

647,980. Electric Elevator. J. F. Morrison and O. M. Woodrow, Wellston, O.

648,009. Maximum Meter. H. O. Westendarp, Saugus, Mass.

648,052. Brush-Holder. E. D. Priest, Schenectady, N. Y.

648,057. Third-Rail Insulator. E. W. Rice, Jr., Schenectady, N. Y.

648,069. Burglar and Fire Alarm. J. W. Culp, Wakarusa, Ind.

648,081 to 648,086. Electric Rail Bond. C. F. de Redon, New York, N. Y.

648,092. Electromagnetic Electric Railway Track Switch. P. B. Williams, Washington, D. C.

648,118. Commutator. H. F. Stubenrauch, Chicago, Ill.

648,122. Electric Igniter for Explosive Engines. W. F. Davis, Waterloo, Iowa.

648,144. Electric-Lighting Apparatus. R. N. Chamberlain, Depew, N. Y.

648,171. Door Releaser. D. F. Latin, Clinton, Mass.

648,252. Electric Signaling System for Railways. M. Garl, Akron, O.

648,273. Brake for Electric Motors. C. A. Lindstrom, Chicago, Ill.

648,274. Controller Switch. A. C. Lindstrom, Chicago, Ill.

648,283. Acetylene-Gas Generators. H. P. Nielsen, Alameda, Cal.

648,295. Electric Arc Lamp. W. E. Pugsley, Lincoln, Neb.

648,296. Electric Clock. P. M. Ravenskilde, Cabery, Ill.

648,335. Coin-Freed Electric Meter. F. J. Beaumont, London, England.

648,367. Fire-Alarm System and Apparatus. R. A. Smith, Norfolk, Va.